TM 3-6665-209-12

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

INDICATOR, OUTLET VALVE LEAKAGE, M4A1 (END ITEM CODE 667)

This reprint includes all changes in effect at the time of publication - Change 1.

HEADQUARTERS, DEPARTMENT OF THE ARMY

FEBRUARY 1964

SAFETY PRECAUTIONS

The indicator is energized from an external power source with 120 volts ac but through the power transformer T1 of the indicator, 600 volts ac is present in the electron tube circuit. These leads are all fastened to bare terminals. Before changing orifices or opening the cabinet lid, disconnect the power cord.

Never use the STEADY BLAST or BLAST TEST positions of the mode switch S4 when the mode of operation is "pressure" in the indicator.

Once the test of an outlet valve is started, do not remove the outlet valve from the VALVE fixture until the test cycle is completed. Damage to the indicator will result.

Take the probe assembly off the inside of the cabinet lid and set it aside while operating the indicator. This will prevent it from accidentally falling off during operation and perhaps damaging the indicator.

Change No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, *11 July 1972*

Operator's and Organizational Maintenance Manual
INDICATOR, OUTLET VALVE LEAKAGE, M4A1
FSN 6665-738-2128

TM 3-6665-209-12, 19 February 1964, is changed as follows:

Title is changed as shown above.

Page 2. Paragraph 2 is deleted.

Paragraph 3 is superseded as follows:

3. Record and Report Forms

a. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750.

b. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded directly to Commanding Officer, Edgewood Arsenal, ATTN: SMUEA-DE-ET, Edgewood Arsenal, MD 21010.

c. Refer to TM 740-90-1 for administrative storage instructions on this equipment.

Page 3. Paragraph 4 is rescinded.

Page 34, paragraph 54. The last sentence is rescinded.

Page 43. Chapter 5 title is superseded as follows:

CHAPTER 5. SHIPMENT AND DEMOLITION TO PREVENT ENEMY USE

Paragraph 78 is deleted.

Page 44, appendix I, references. TM 9-213 is rescinded.

Title of TM 38-750 is changed as follows:

The Army Maintenance Management System (TAMMS)

Add the following:

TM 740-90-1 Administrative Storage of Equipm

Pages 49 and 50, appendix III. Appendix is superseded as follows:

APPENDIX III
BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST

Section I. INTRODUCTION

Not required.

Section II. BASIC ISSUE ITEMS LIST

There are no basic issue items for the M4A1 outlet valve leakage indicator.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

There are no items troop installed or authorized for the M4A1 outlet valve leakage indicator.

By the Order of the Secretary of the Army:

BRUCE PALMER, JR.
General, U. S. Army
Acting Chief of Staff

Official:

VERNE L. BOWERS,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-28, Section I (qty rqr block No. 71) Direct and General Support Maintenance requirements for Maintenance Equipment.

TECHNICAL MANUAL
No. 3-6665-209-12

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *19 February 1964*

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

INDICATOR, OUTLET VALVE LEAKAGE, M4A1 (END ITEM CODE 667)

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

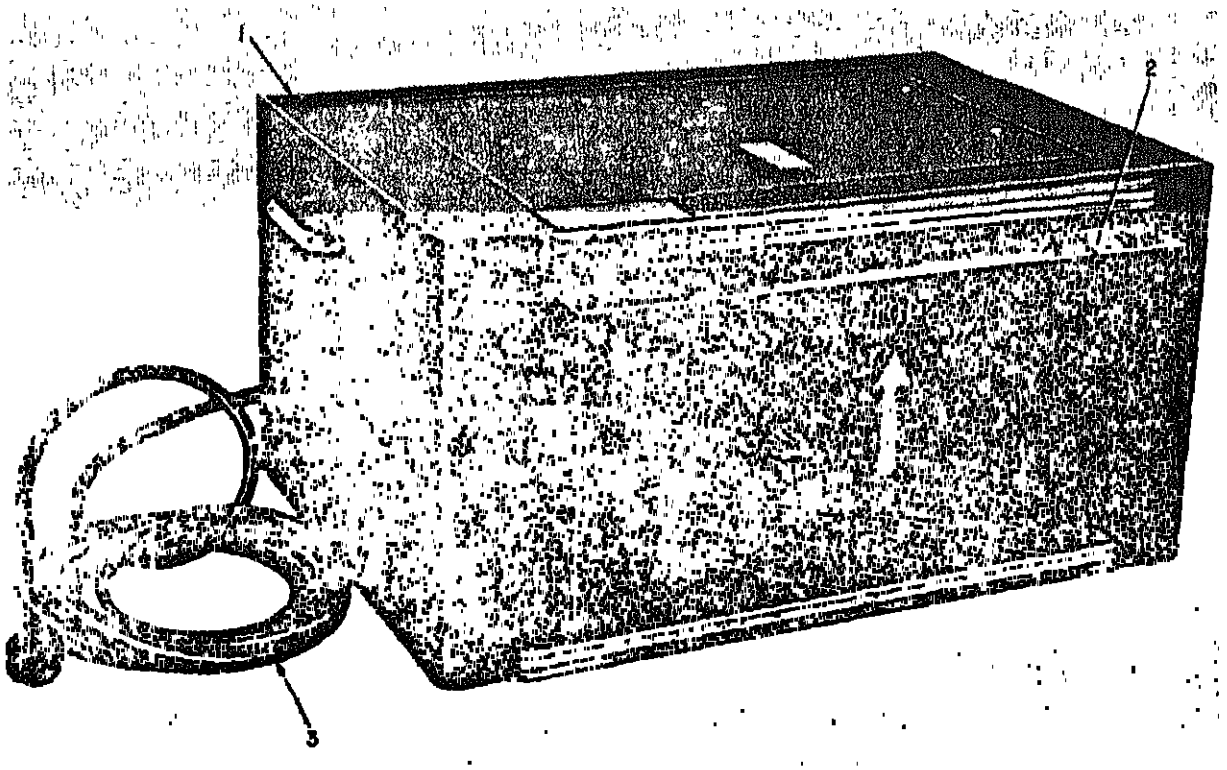
This manual is published for the use of the personnel to whom the M4A1 outlet valve leakage indicator (figs. 1 and 2) is issued. It contains information on the operation and maintenance of the indicator together with a description of the major groups and their functions in relation to other components of the equipment. Hereinafter this equipment will be referred to as an indicator.

2. Appendixes

Appendix I contains a list of current references. Appendix II contain the maintenance allocation chart. Appendix III contains the basic issue item list.

3. Record and Report Forms

a. Use the appropriate forms prescribed by TM 38–750.



1 Cabinet assembly 2 Panel cover assembly 3 Power cord

Figure 1. M4A1 outlet valve leakage indicator, right front view.

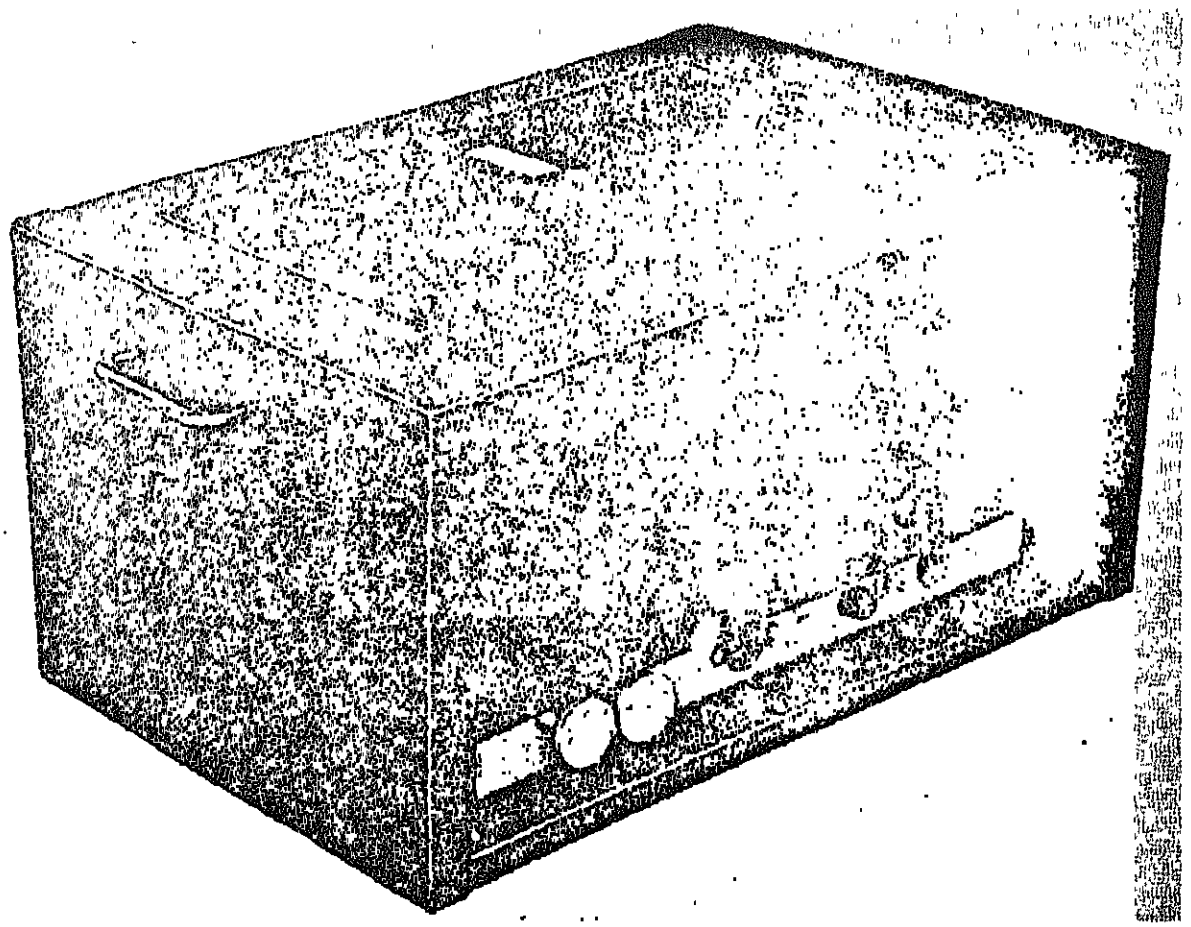


Figure 2. M4A1 outlet valve leakage indicator, left rear view.

b. The direct reporting by the individual user of errors, omissions, and recommendations for improving this manual is authorized and encouraged. DA Form 2028 (Recommended Changes to DA Technical Manual Parts Lists or Supply Manual 7, 8, or 9) will be used for reporting these improvements. This form will be completed in triplicate using pencil, pen, or typewriter. The original and one copy will be forwarded direct to Commanding General, U.S. Army Edgewood Arsenal, ATTN: SMUEA-EIS-EM-P, Edgewood Arsenal, Md. 21010. One information copy will be provided to the individual's immediate supervisor (e.g., officer, noncommissioned officer, or supervisor).

c. Use DD Form 6 (Report of Damaged or Improper Shipment) to report damaged or improper shipment of materiel.

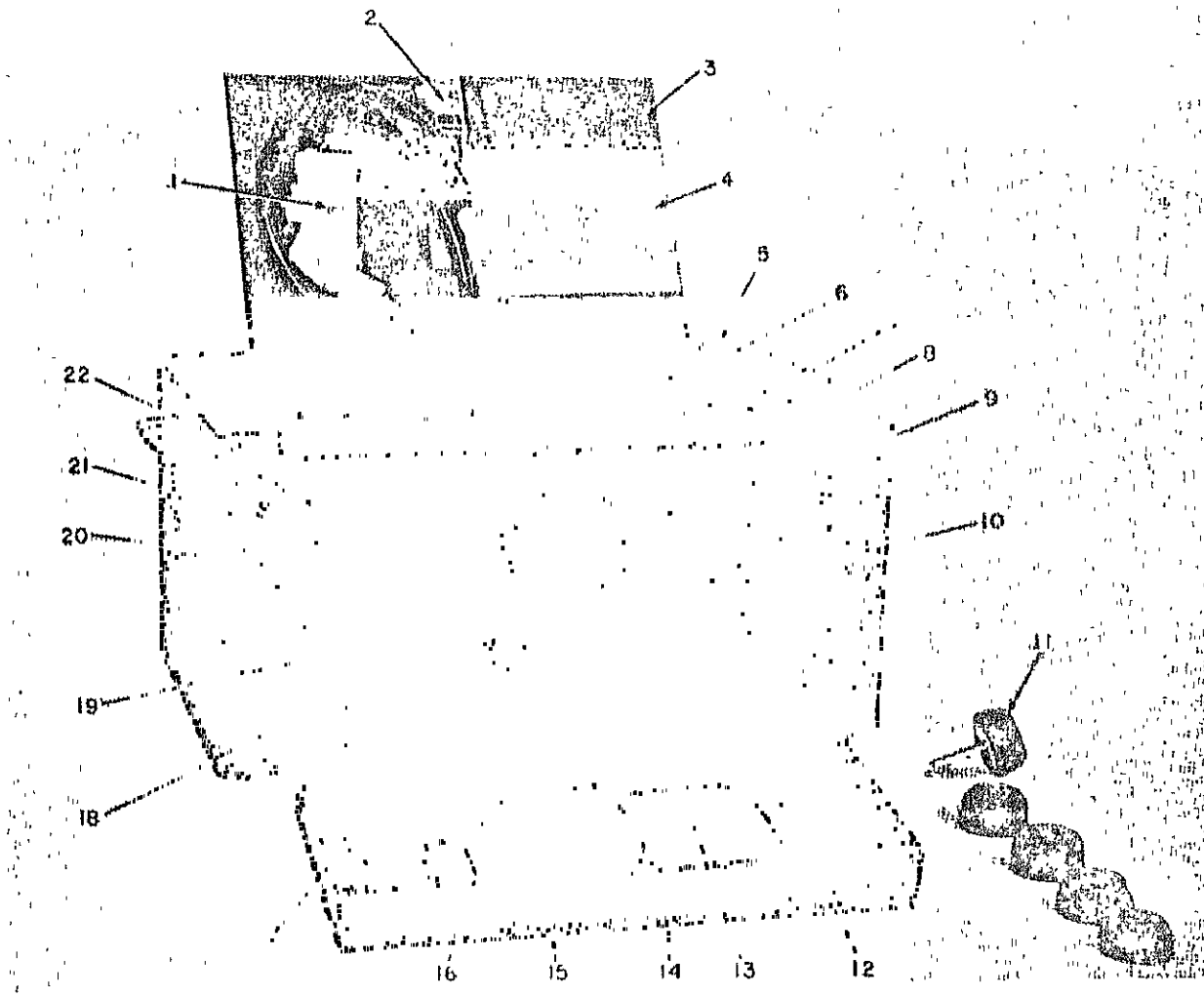
4. Allocation of Maintenance

Refer to the maintenance allocation chart (app. II) to determine maintenance services authorized for organizational maintenance personnel. Maintenance operations not authorized at organizational level must be reported to field maintenance personnel. Be sure that a part is in stock before attempting to replace it.

Section II. DESCRIPTION

5. General Description

The M4A1 outlet valve leakage indicator (fig. 3) consists of a cabinet assembly (5), a panel covered assembly (15), a chassis assembly, a test probe assembly (1), and accessory equipment. The chassis assembly, which contains



1 Probe assembly
2 Catch and lock fastener
3 Cabinet lid
4 Wiring diagram
5 Cabinet assembly
6 Push TO CALIBRATE pushbutton switch S2
7 Pressure gage
8 REJECT light DS4
9 ACCEPT light DS3
10 VALVE fixture
11 Test fixture assembly
12 Test probe electrical receptacle connector J1
13 CALIBRATE knob
14 Vacuum diagram
15 Panel cover assembly
16 Water manometer
17 BLEEDER valve control
18 Front panel
19 PILOT light DS1
20 LINE toggle switch S6
21 Mode switch S4
22 PUMP toggle switch S5

Figure 3. M4A1 outlet valve leakage indicator with cabinet lid open and panel cover removed.

most of the components of this indicator, consists of two sections; they are the electrical components section and the mechanical components section. Separate topical paragraphs that follow describe in detail the component party of the indicator.

6. Cabinet Assembly

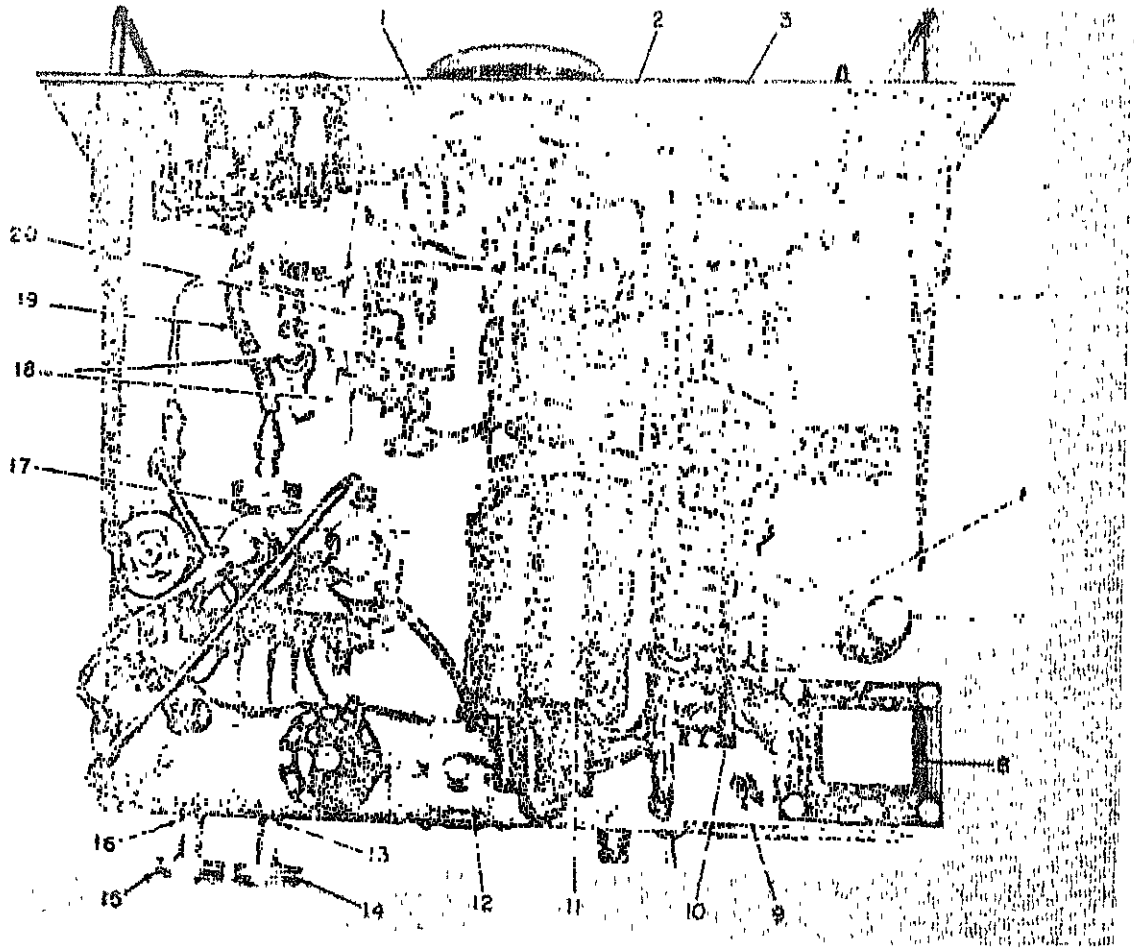
The cabinet assembly (5, fig. 3) provides the housing for the chassis assembly of the indicator. Two rigid handles mounted on the sides of the cabinet are utilized for moving the indicator. A hinged lid occupies most of the top of the indicator and it provides quick access to the chassis assembly components. An integral catch and lock fastener (2) secures the hinged cabinet lid (3) to the cabinet. A wiring diagram (4) and the test probe assembly (1) are stowed on

the inside surface of the hinged cabinet lid. The cabinet measures approximately 11 inches high, 23 inches long (with handles mounted), and 17½ inches wide (with panel cover assembly installed).

7. Panel Cover Assembly

The panel cover assembly (15 fig. 3) is mounted over the front panel of the chassis assembly and it is readily removed by pulling it from the front panel. Four cover retaining springs that are in the inside of the panel cover engage and grip the chassis assembly handles firmly to keep the panel cover assembly in place on the front panel when the indicator is not in use. Besides protecting the components on the front panel, the panel cover assembly houses a water manometer (16) with rubber tube pyrex glass orifices, and a vacuum diagram (14).

a. Water Manometer. The water manometer (16, fig. 3) consists of a 6-inch U-shaped pyrex glass tube, a 30-inch rubber tube, a scale, a mounting plate, and clips. The water manometer is used for checking the pressure balance on either side of the diaphram in the calibrator assembly. In use, it is left inside the panel cover



1 Filter FL4
2 Selector valve and blower adapter
3 Blower
4 Lamp DS1
5 Holding relay K1
6 Keying relay K2
7 Electron tube V1
8 Power transformer T7
9 Selector toggle switch S8
10 Terminal board TB1
11 Motor B1
12 Pump
13 Comparison orifice O2
14 Filter FL3
15 Filter FL2
16 Comparison orifice O1
17 Filter FL1
18 Plug cocks
19 Rubber tubing
20 Sensitive diaphragm switch S1

Figure 4. Chassis assembly, top view.

AGO 8038A

assembly and the glass tube is filled with water and the free end of the rubber tube is connected to the open end of the copper tubing of one or the other of the two plug cocks (18, fig. 4) of the calibrator assembly. The rubber tube is long enough to allow the water manometer to be set up and observed together with the front panel while both are being used.

b. Sized Pyrex Orifices. The sized pyrex orfiices are precise lengths of capillary glass tubing that have the air flow direction (indicated by an arrow) and the millimeter per minute flow rate number etched on each orifice. In table I these signal orifices are further identified as comparison, balance, and calibration standard orifices to designate their precise location and use in the indicator. The comparison orifices O1 (16, fig. 4) and O2 (13) are used to pass air at a rate equivalent to the maximum allowable leak of the outlet valve being tested. The balance orifices O3 (2, fig. 5) and O4 (1) are used to insure that pressure is equal on each side of the diaphragm within the calibrator assembly. The calibration standard orifices when in use are assembled into the calibration testing adapters (the calibration testing adapters are explained in par. 20). The calibration standards are used only to test the calibration of the indicator. They are used in matched pairs. One size of calibration standard orifice will pass air at a rate less than acceptable, and the other will pass air at a rate greater than acceptable. The pyrex glass orifice sizes and millimeters per minute flow rate are presented in the following list:

Size	*ml./min.*	*Size*	*ml./min.*
1	14	*15	150
* 2	15	16	160
3	16	*17	170
* 7	120	*18	250
14	140	*19	280
		20	235
		21	265

*Used in matched pairs (as prescribed in table I).

None of these sized pyrex orifices is less than one- half inch long nor more than 1¼ inches long.

***Caution:* When in use guard against breaking these orifices. Remember to always insert each orifice in the indicator so that the direction of air flow of the orifice matches the direction of air flow in the indicator. Table I lists the values of all orifices to be used during use of the indicator. Exercise care to have the correct size of orifices in the indicator during any particular test.**

c. Vacuum Diagram. The vacuum diagram is screw fastened to the inside of the panel cover assembly. It is a white print laminated between two sheets of clear plastic. This vacuum diagram presents a simplified version of the air flow in the indicator.

8. Chassis Assembly

Note. Most of the components of the indicator are located in this chassis assembly. To discuss all of these components in one numbered paragraph would make the paragraph very large. Therefore, to simplify the presentation, several numbered paragraphs are assigned to this portion of the manual.

The chassis assembly consists of a chassis base (7, fig. 5), a front panel (3), an electric chassis assembly (6), a motor and pump assembly (11) a calibrator assembly (22) a power cord (3, fig. 1), solenoid valve assemblies (16, 17, 18, and 19, fig. 5), and many electrical and mechanical components. Four washers and capscrews (21) are used to secure the chassis assembly in the cabinet assembly. When the washers and capscrews are removed and the power cord and plant air supply are not connected to the indicator, the chassis assembly can be pulled as a drawer from the cabinet assembly. The chassis assembly components are described under the following titles in separate numbered paragraphs—chassis base (par. 9), front panel components (par. 10). Mechanical components (par. 11), electrical chassis assembly mounted components (par. 12) chassis assembly mounted electrical components (par. 13), motor and pump assembly (par. 14), calibrator assembly (par. 15), power cord (par. 16), and solenoid valve assemblies (par. 17).

9. Chassis Base

The chassis base (7, fig. 5) provides the platform for mounting the working parts of the indicator. It is approximately 13 inches wide, 17 inches long, and 2 inches thick. Many holes are provided in the chassis base for routing copper tubing, electrical wire, and fastening mounting hardware. Electronic reference designation markings are marked in black characters at their respective locations. Parts are attached to the sides, top, and bottom of the chassis base.

...ssories and Requirements for Operation of the M4A1 Outlet Valve Leakage Indicator

Protective mask	Component to be tested	Mode of Operation	Test fixture assembly		Probe assembly			Holding fixture	Sized pyrex orifices ml./min.			Test pressure mm of water	Calibration testing adapter
			Rubber adapter used with type I plunger	Rubber adapter used with type II plunger	Rubber adapter	Barrel	Mask tip screw		Comparison 0-1 & 0-2	Balance 0-3 & 0-4	Calibration standards		
Mask, Protective, Field, M9A1	Valve, outlet, field protective mask, C15	Vacuum	A25-3-173	N/A	A25-3-226	A25-3-225	A25-3-227	N/A	15	120	14 & 16	25	A25-3-259
	Disk, outlet valve	Vacuum	A25-3-173	N/A	N/A	N/A	N/A		15	120	14 & 16	25	A25-3-250
	Valve, nosecup	Vacuum	N/A	B136-45-170					150	170	140 & 160	25	B136-45-157-5
	Mounting canister, gas mask	Vacuum		C136-45-194					250	280	235 & 265	25	B136-45-157-5
	Disk, inlet valve	Vacuum	N/A	C136-45-194	N/A	N/A	N/A		250	280	235 & 265	25	B136-45-157-5
Mask, Protective, Tank, M14A1	Valve, outlet field protective mask, C15	Vacuum	A25-3-173	N/A	A25-3-226	A25-3-225	A25-3-227		15	120	14 & 16	25	A25-3-250
	Disk, outlet valve	Vacuum	A25-3-173		N/A	N/A	N/A		15	120	14 & 16	25	A25-3-250
Mask, Protective, Tank, ABC - M14A2	Valve, outlet, field protective mask, C15	Vacuum	A25-3-173		A25-3-226	A25-3-225	A25-3-227		15	120	14 & 16	25	A25-3-250
	Disk, outlet valve	Vacuum	A25-3-173		N/A	N/A	N/A		15	120	14 & 16	25	A25-3-250
Mask, Protective, Noncombat, M15	Valve, outlet, M11	Vacuum	A25-3-173		A136-14-39	A25-3-225	A136-14-38		15	120	14 & 16	25	A25-3-250
	Disk, outlet valve	Vacuum	A25-3-173		N/A	N/A	N/A		15	120	14 & 16	25	A25-3-250
	Seat, outlet valve assembly, for M11 outlet valve	Vacuum	A25-3-173	N/A					15	120	14 & 16	25	A25-3-250
Mask, Protective, Field, ABC - M17	Valve, nosecup	Vacuum	N/A	B136-45-170					150	170	140 & 160	25	B136-45-157-5
	Valve, nosecup (assembly on nosecup)	Vacuum		B136-45-134					150	170	140 & 160	25	B136-45-157-3
	Disk, valve, nosecup	Vacuum		B136-45-170					150	170	140 & 160	25	B136-45-157-5
	Cap - inlet valve assembly, C28	Vacuum		B136-44-96					150	170	140 & 160	25	B136-45-157-4
	Disk, valve, inlet	Vacuum		B136-44-96					150	170	140 & 160	25	B136-45-157-4
	Voicemitter - outlet valve assembly, C29E1	Vacuum		B136-44-37					15	120	14 & 16	25	B136-45-157-2
	Seat, outlet valve	Vacuum		A136-45-148					15	120	14 & 16	25	B136-45-157-2
	Disk, outlet valve	Vacuum	N/A	A136-45-148	N/A	N/A	N/A		15	120	14 & 16	25	B136-45-157-3
	Voicemitter - outlet valve assembly (assembled in ABC - M17 mask)	Pressure	A25-3-173	N/A	*B136-45-181	*B136-45-181	*A25-3-227		15	120	14 & 16	25	B136-45-157-1
Mask, gas, rocket propellant, M21	Valve, outlet, field protective mask, C15	Vacuum	A25-3-173		A25-3-226	A25-3-225	A25-3-227		15	120	14 & 16	25	A25-3-250
Mask, Protective Aircraft, M24	Valve, outlet, field protective mask, C15	Vacuum	A25-3-173		A25-3-226	A25-3-225	A25-3-227		15	120	14 & 16	25	A25-3-250
	Disk, outlet valve	Vacuum	A25-3-173		N/A	N/A	N/A		15	120	14 & 16	25	A25-3-250
Mask, Protective Tank, M25A1	Valve, outlet, field protective mask C15	Vacuum	A25-3-173		A25-3-226	A25-3-225	A25-3-227		15	120	14 & 16	25	A25-3-250
	Disk, outlet valve	Vacuum	A25-3-173		N/A	N/A	N/A	N/A	15	120	14 & 16	25	A25-3-250
Mask, gas, ND Mark V	Speech diaphragm, outlet valve	Vacuum	A25-3-173	N/A	N/A	N/A	N/A	D136-45-161	15	120	14 & 16	25	B136-45-164-1 and -2

N/A = means not applicable.

*Preassembled - assembly No is B136-45-192

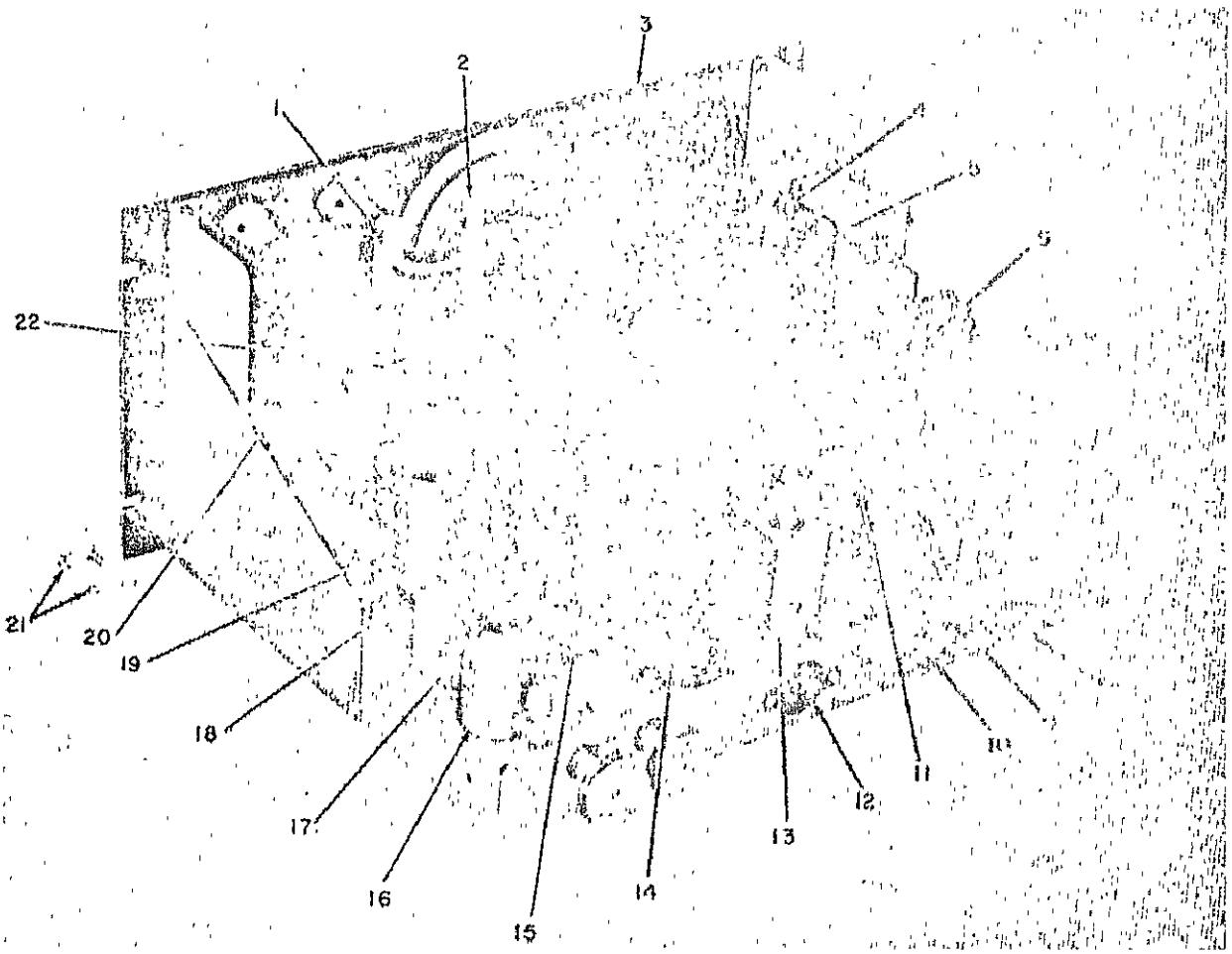
Notes.

Orifices. Each orifice has the word FLOW plus an arrow (——›) and the ml./min. flow numbers etched on its surface to insure positive identification.

Rubber adapters and probe assembly adapters. The rubber adapters and probe assembly adapters have the drawing number molded or embossed on their surface to insure positive identification.

Calibration testing adapter. The drawing number is marked on its outer surface to insure positive identification.

Type I and II plungers. Type I or type II is stamped on each plunger to insure positive identification.



1	Balance orifice 04	9	Bell toggle switch S7	16	Solenoid valve L4
2	Balance orifice 03	10	Fuse F1	17	Solenoid valve L3
3	Front panel	11	Motor and pump assembly	18	Solenoid valve L2
4	Interval timer M1	12	Test counter receptacle connector J2	19	Solenoid valve L1
5	Test cycle timer M2	13	Pump	20	Test cycle switch S3
6	Electric chassis assembly	14	Air shutoff valve	21	Washers and capscrews
7	Chassis base	15	Terminal Board TB2	22	Calibrator assembly
8	Line receptacle connector J3				

Figure 5. Chassis assembly, left rear view.

10. Front Panel Components

a. Front Panel. The front panel (18, fig. 3) is a metal plate about 19 inches long, 8¾ inches high, and ⅛-inch thick painted with black wrinkle paint. Electronic reference designation markings are in white characters at their respective locations. Many holes are provided in the front panel for fastening components to the front panel. The following components are located in the front panel of the indicator.

b. Pressure Gage. The pressure gage (7) is located at the center of the front panel. The gage has a center zero position and provides full scale indications of 2 inches of water (pressure or vacuum).

c. BLEEDER Valve Control. The BLEEDER valve control (17), is below and to the left of the pressure gage (7). The control is used to adjust the pressure (or vacuum) in the system.

d. CALIBRATE Knob. The CALIBRATE knob (13), is below and to the right of the pressure gage (7). This knob is geared to open or close the gap between the electrical contact points of the diaphragm and a movable contactor in the plenum chamber. Rotation of the CALIBRATE knob actuates a high reduction

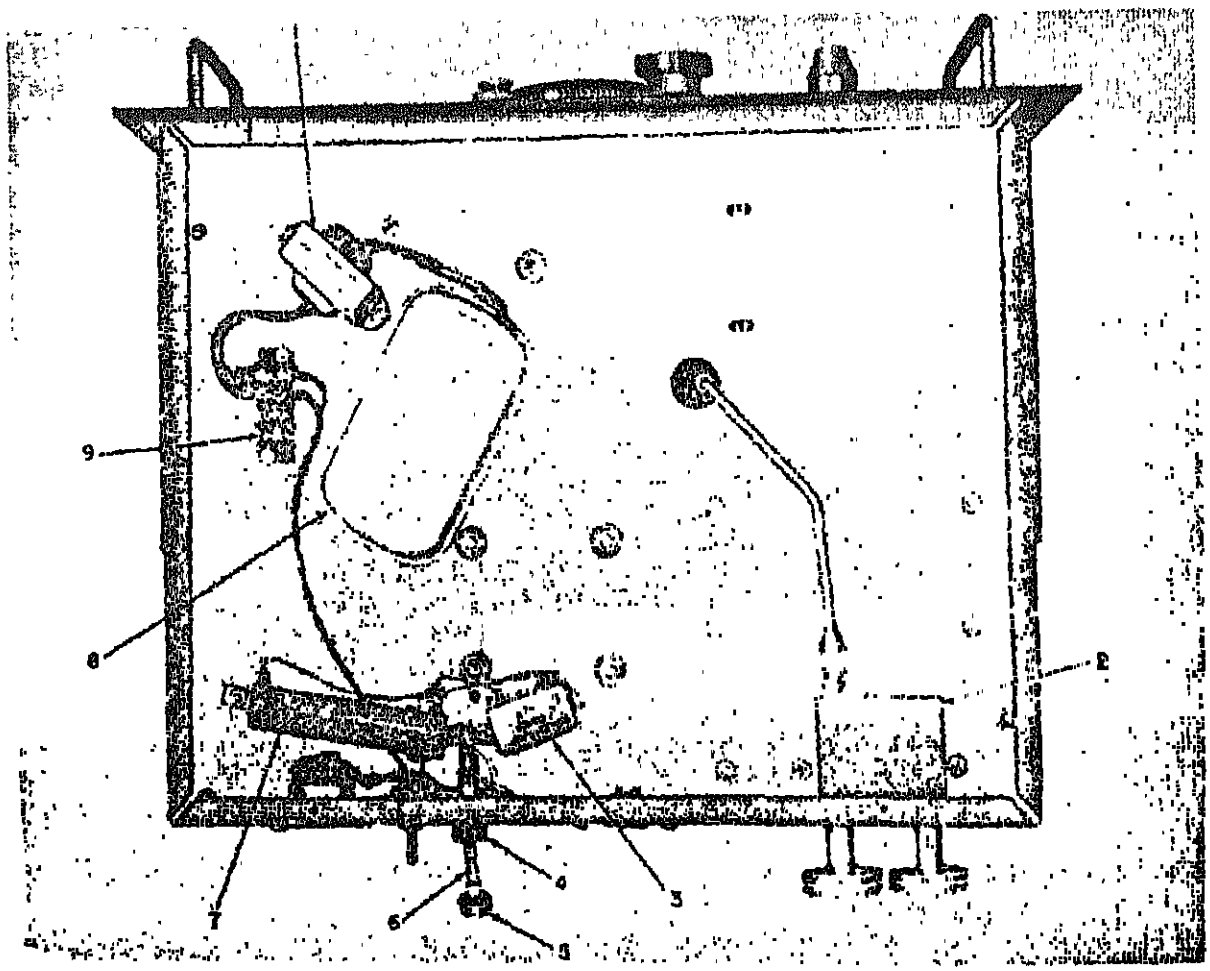
worm gear for positioning the movable contactor.

e. PUSH TO CALIBRATE Pushbutton Switch. The PUSH TO CALIBRATE pushbutton switch S2 (6) is above and to the left of the pressure gage (7). This two-position pushbutton switch S2 is used when adjusting and checking the null point position of the diaphragm in the plenum chamber.

f. ACCEPT and REJECT Lights. The ACCEPT light DS3 (9) and REJECT light DS4 (8) are located above and to the right of the pressure gage (7). The REJECT light is red and indicates rejection of an outlet valve under test. The ACCEPT light is green and indicates acceptance of an outlet valve under test.

g. Mode Switch. The mode switch S4 (21) is located directly to the left of the pressure gage (7). The mode switch S4 is a three-position switch. The upper position, marked STEADY BLAST, is used to provide a steady blast of air through the VALVE fixture to dislodge foreign matter from the outlet valve to be tested. The middle position, marked NORM, is used to provide a normal test cycle consisting of an outlet valve conditioning pulsating period followed by the leakage comparison period. This sequence is initiated when the VALVE fixture is pressed in. The lower position, marked BLAST TEST, is used to provide a short blast of air followed by the leakage comparison test.

h. PUMP Toggle Switch. The PUMP toggle



Bell transformer T2
Orifice block
Radio noise suppression capacitor C2
4 Fuse holder XF1
5 Fuse cap
6 Fuse F1
7 Governor resistor R1
8 Electric bell DS5
9 Terminal board TB3

Figure 6. Chassis assembly, bottom view.

switch S5 (22) is in the upper left corner of the panel. This switch is used to start and stop the motor and pump assembly (11, fig. 5).

i. LINE Toggle Switch. The LINE toggle switch S6 (20, fig. 3) is directly below the PUMP toggle switch S5 (22). The LINE toggle switch controls the power to the indicator.

j. PILOT Light. The PILOT light DS1 (19) is directly below the LINE toggle switch S6. When lit, the PILOT light indicates that power is supplied to the indicator.

k. VALVE Fixture. The VALVE fixture (10) is located to the left of the pressure gage (7). The applicable test fixture assembly, listed in table I, is mounted on the VALVE fixture to accept the outlet valve to be tested.

l. TEST PROBE Electrical Receptacle Connector. The TEST PROBE electrical receptacle connector J1 (12) is directly below the VALVE fixture (10). It provides an electrical connection to the test probe assembly (1).

m. Unit Nameplate. Refer to paragraph 23*a* for indicator nameplate identification.

11. Mechanical Components

Some of the mechanical components of the chassis assembly (not included in the other numbered paragraphs) are the orifice block (2, fig. 6), plant air shutoff valve (14, fig. 5) assembly, VALVE fixture (10, fig. 3), bleeder housing, orifice and filter holder housing, grommets, rubber, plastic, and copper tubing, plug cocks (18, fig. 4) and the selector valve (2).

a. Orifice Block. The orifice block (2, fig. 6) is an aluminum block that provides the housing for comparison orifices 01 (16, fig. 4) and 02 (13). The orifice block is mounted to the underside of the chassis base. Filter housings for filters FL2 (15) and FL3 (14) screw into the orifice block. The orifice block permits filtered measured air to be drawn into and used by the indicator.

b. Plant Air Shutoff Valve Assembly. The plant air shutoff valve assembly controls the supply of clean filtered plant air that is regulated to a pressure of 20 psig. The plant air supply line connects to the inlet of the valve. This valve assembly includes a mounting bracket. The bracket provides the means of attaching the valve to the chassis assembly.

c. VALVE Fixture. The VALVE fixture is composed of the applicable test fixture assembly listed in table I. By mounting the applicable test fixture assembly at this location, the operator adapts the indicator to test any outlet valve.

d. Bleeder Housing. The bleeder housing is a circular steel part that routes the pressure (or vacuum) in the indicator according to the settings of the BLEEDER valve control on the front panel.

e. Orifice and Filter Holder Housings. Both housings for orifice filters FL2 (15) and FL3 (14) consist of a filter cap, an orifice filter, and an orifice housing. Both housings for orifice filters FL1 (17) and FL4 (1) consist of a filter mounting flange, an orifice filter, and a filter cap.

f. Grommets. Rubber grommets are used to protect electrical wiring from becoming frayed as its strings through routing holes in the chassis base.

g. Rubber, Plastic, and Copper Tubing. Three pieces of rubber tubing are used in the indicator. One rubber tubing, 9 inches long, connects between the selector valve and blower adapter (2) and the motor blower housing. The second rubber tubing, 7 inches long, connects between the bleeder housing and the selector valve and blower adapter. The third rubber tubing connects between the test valve plunger and the copper tubing upstream from orifice filter FL1. The plastic tubing connects between the outlet from the pump and solenoid valve L3 (17, fig. 5). Copper tubing of varying wall thicknesses and lengths is used in the indicator to interconnect components.

h. Plug Cocks. Two plug cocks (18, fig. 4) are provided in the lines to permit attachment of the water manometer (16, fig. 3) to either side of the diaphragm in the plenum chamber of the calibration assembly. This makes it possible to test the pressure balance between both sides of the diaphragm.

i. Selector Valve and Blower Adapter. The selector valve and blower adapter (2, fig. 4) is a manually operated four-way valve used to select either a pressurized or evacuated system, as produced by the blower (3). When in the V (vacuum) position, the valve allows the blower to cause a slight negative pressure in the

plenum chamber. Conversely when operated to the P (pressure) position, the air flow from the blower is reversed in the indicator to cause the plenum chamber to become slightly pressurized. The test pressure (positive or negative) is read on the pressure gage (7, fig. 3).

12. Electrical Chassis Assembly Mounted Electrical Components

The following electrical components are mounted on the electrical chassis:

a. Interval Timer. The interval timer M1 (4, fig. 5) is mounted on the electrical chassis of the indicator. It is energized by the test cycle switch S3 (20) and remains on for approximately 1¾ seconds. At this time, the first switch contact on the interval timer M1 energizes solenoid valve L4 (16). The energized solenoid valve L4 cuts off pulsating air from the pump (12, fig. 4). After about two seconds of elapsed time, the second switch contact on the interval timer M1 energizes solenoid valve L2 (18, fig. 5). The energized solenoid valve L2 supplies power through the contact of the holding relay K1 (5, fig. 4) to the green ACCEPT light DS3 (9, fig. 3).

b. Test Cycle Timer. The test cycle timer M2 (5, fig. 5) is mounted on the electrical chassis next to the interval timer M1 (4). The test cycle timer M2 is energized by the test cycle switch S3 (20) and remains on for approximately 6 seconds. The first 2 seconds of this total energized time are expended during operation of the interval timer M1 (*a* above). The test cycle of up to 4 seconds additional elapsed time is normal for the test cycle timer to complete the test cycle. At this time the contacts on the test cycle timer M2 open, the holding relay K1 coil circuit is opened, and this deenergizes the holding relay K1 (5, fig. 4) which in turn deenergizes the solenoids in solenoid valves L2 and L4, and ends the test cycle.

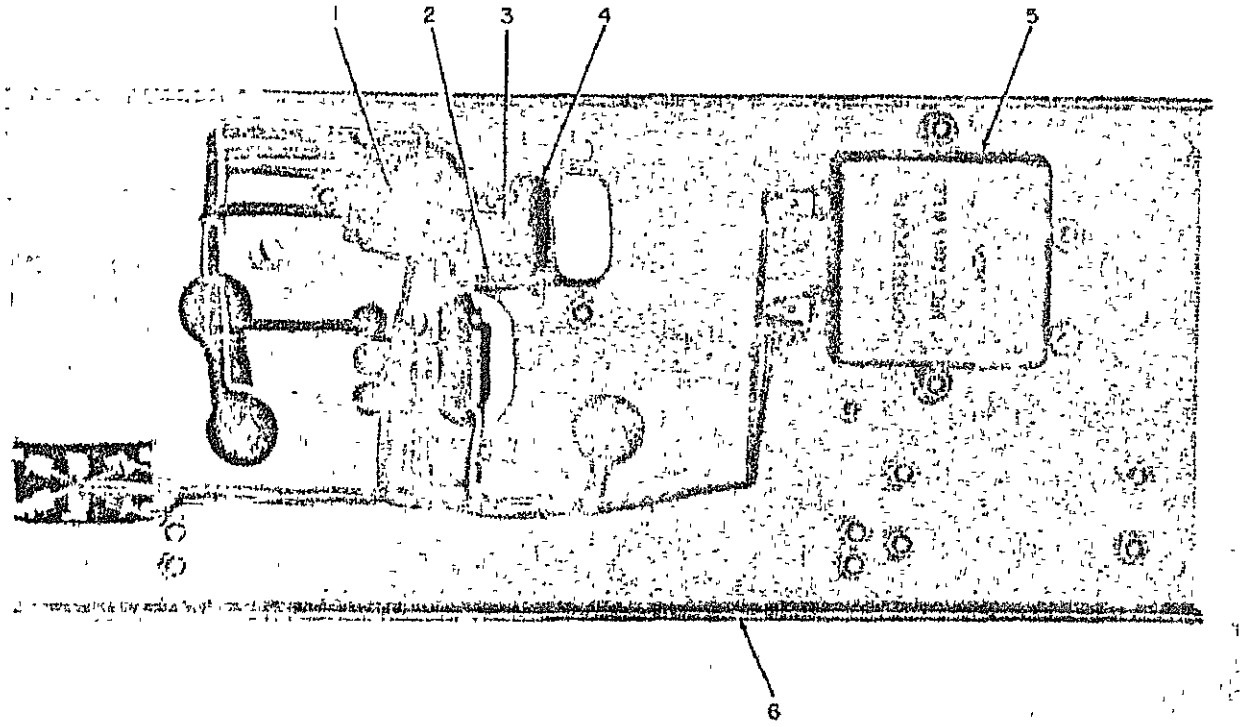
c. Holding Relay. The holding relay K1 (5) is energized when the outlet valve to be tested is pushed into the test position (test cycle switch S3 energized). The holding relay K1 remains energized until the test cycle is completed. A second pair of contacts in the holding relay K1 are connected to the test counter receptacle connector J2 (12, fig. 5). These contacts close on every green (accept) signal, and can be connected to a counter to count the number of items accepted. (Any counter used is not a part of this indicator.)

d. Keying Relay. The keying relay K2 (6, fig. 4) is energized by the plate circuit of the electron tube V1 (7), and it switches power from the green ACCEPT light DS3 (9, fig. 3) to the red REJECT light DS4 (8). A second pair of contacts is connected to the test counter receptacle connector J2 (12, fig. 5). These contacts close on every red (reject) signal, and can be connected to a counter to count the number of items rejected. (Any counter used is not a part of this indicator.)

e. Selector Toggle Switch. The selector toggle switch S8 (9, fig. 4) is a double pole, double throw toggle switch used to adapt the ACCEPT and REJECT light circuits to the particular mode of operation (pressure or vacuum) being used. The switch should always be in the same position (P or V) as the selector valve (2).

f. Capacitor C1. Capacitor C1 (5, fig. 7) is a metal can, hermetically sealed, 2.0 mfd, 600 volts, dc, oil impregnated, oil-filled capacitor. It is mounted to the underside of the electrical chassis (6) and is in parallel with the coil of keying relay K2 to prevent chattering and/or erratic operation of the relay coil by blocking the flow of direct current while allowing alternating and pulsating currents to pass.

g. Electron Tube. The electron tube V1 (7, fig. 4) is a standard 6J5GT triode electron tube type. It is equipped with pins and by use of a keying device mates with the octal socket receptacle which is mechanically attached to the electrical chassis. The octal socket has wires soldered to its terminals, thus connecting them permanently into the electrical circuitry. One secondary winding in power transformer T1 (8) supplies filament voltage to the electron tube. A secondary winding of the power transformer supplies approximately 600 volts center-tapped to the grid and plate of the electron tube. At one half of the alternating voltage cycle, the plate end of this secondary winding is positive and approximately +300 volts is applied to the plate through the coil of the keying relay K2 (6). The other end of the keying relay coil winding is at —300 volts. Approximately one-tenth of this negative voltage is obtained from



1 Resistor R3
2 Resistor R4
3 Resistor R2
4 Capacitor C3
5 Capacitor C1
6 Electrical chassis

Figure 7. Electric chassis assembly, bottom view.

voltage divider resistors R3 (1, fig. 7) and R4 (2) and is applied to the electron tube grid through resistor R4 (2). This negative grid voltage is sufficient to prevent the flow of positive plate current, and the keying relay K2 (6, fig. 4) does not operate. At the other half of the alternating voltage cycle, the plate is negative. The electron tube grid is positive, hence current flows from grid to cathode. This current is limited to a minute amount by resistor R3 (1, fig. 7). The electron tube grid is connected to the movable contactor needle assembly of the sensitive diaphragm switch S1 (20, fig. 4). When the pressure (or vacuum) differential is sufficient to cause the diaphragm to contact the point of the contact shaft, the grid is connected to the cathode. This removes the negative bias permitting plate current to flow, thus energizing the keying relay K2. Since current flows only on the positive half cycles, capacitor C1 (5, fig. 7) is placed in parallel with the coil of the keying relay K2. This prevents chattering and/or erratic operation of the keying relay K2. Filament voltage of 6.3 volts is applied to the electron tube from a secondary winding of the power transformer.

h. Power Transformer. The power transformer T1 (8, fig. 4) is used to obtain the desired ac voltages from a fixed ac source. It is a double half shell with leads and the primary winding is 117 volts at 50–60 cps ac rating and provides a tapped high voltage secondary winding as well as a filament winding of 6.3 volts.

i. Resistors R2, R3, and R4. These three fixed carbon particles and ceramic binder resistors (1, 2, and 3, fig. 7) are molded into a cylindrical shape and are equipped with connecting leads to both ends. Resistor R3 (1) is a 1.5 megohm +10 percent and ½ watt type. Resistor R2 (3) is a 16 megohm +10 percent and ½ watt type. Resistor R4 (2) is a 100 ohm +10 percent and ½ watt type. These resistors are used in electrical circuits to offer resistance to the flow of electric current. Resistors R2, R3, and R4 are

mounted on the underside of the electrical chassis (6).

j. Capacitor C3. Capacitor C3 (4) is a mica dielectric with 0.003 mfd and 500 watts vdc rating. It is marked according to the military specification code using a six-dot marking. The use made of capacitor C3 in this installation is to pass alternating current and to block direct current as well as having the ability to store an electrical charge. Capacitor C3 is mounted to the underside of the electrical chassis (4).

k. Terminal Board. Terminal board TB1 (10, fig. 4), mounted on top of the electrical chassis, has 16 pairs of terminals all of which are used. In addition, two mounting holes are at each end of this terminal board.

13. Chassis Assembly Mounted Electrical Components

The following electrical components are mounted on the chassis of the indicator:

a. Governor Resistor and Radio Noise Suppression Capacitor. The governor resistor R1 (7, fig. 6) and the radio noise suppression capacitor C2 (3) are used to minimize radio interference from the motor governor. Both are mounted on the underside of the chassis base. The governor on the motor is adjustable and is used to control the motor speed.

b. Test Counter Receptacle Connector. The test counter receptacle connector J2 (12, fig. 5) is mounted on the rear of the chassis to permit attachment of a counter. (Any counter used is not a part of this indicator.)

c. Line Receptacle Connector. A standard two prong line electrical receptacle connector J3 (8) is mounted on the rear of the chassis to receive the power input through the power cord.

d. Fuse. A line fuse F1 (6, fig. 6) housed inside the fuse holder XF1 (4) at the rear of the chassis protects the power supply circuit.

e. Bell Toggle Switch. The bell toggle switch S7 (9, fig. 5) supplies power to the electrical bell DS5 (8, fig. 6) mounted on the underside of the chassis. The electric bell is wired into the reject circuit. By placing the bell toggle switch S7 on, the electric bell DS5 rings when the red REJECT light (8, fig. 3) goes on.

f. Electric Bell. The electric bell DS5 (8, fig. 6), mounted under the chassis assembly, is used in parallel with the red colored REJECT light circuit to provide an audible indication in addition to the visual indication, provided by the REJECT light, when a reject signal occurs.

g. Bell Transformer. The bell transformer T2 (1, fig. 6) has a primary winding of 117 volts, 60 cps, ac and a secondary winding of 6 volts, 1.2 amperes rating. It is mounted next to the electric bell DS5 (8) and is used to power the bell circuit.

h. Terminal Boards. The terminal board TB2 (15, fig. 5), located on the side of the solenoid valve mounting bracket, has six pairs of terminals. ,The terminal board TB3 (9, fig. 6) mounted on the underside of the chassis base adjacent to the electric bell DS5 (8), has four pair of terminals. In addition, two mounting holes are at each end of the two terminal boards.

i. Sensitive Diaphragm Switch. The sensitive diaphragm switch S1 (20, fig. 4) has one electrical lead fastened by a lug terminal to the calibrator housing. The other electrical lead is fastened by a lug terminal to the contactor needle assembly. The plenum chamber consists of a calibrator plate, a diaphragm, a calibrator housing, and a contactor needle assembly. The diaphragm is a thin brass disk with a thin silver disk soldered to its center. This silver disk provides one electrical contact. The other electrical contact is a silver tip at the end of the contactor needle assembly. The CALIBRATE knob on the front panel controls a high-reduction worm gear for positioning the adjustable contactor needle assembly. The CALIBRATE knob is used to open or close the gap between the electrical contact points of the diaphragm and the movable contactor needle assembly. If leakage through the calibration testing adapter (table I) being used to calibrate the indicator exceeds that permitted by the comparison orifices 01 and 02, the diaphragm touches the point of the contactor needle assembly shaft. When the pressure differential deflects the diaphragm enough to touch the contactor needle assembly, an electrical circuit closes to ground the electron tube grid and remove the negative bias voltage. This permits electron tube plate current to flow thereby energizing the keying relay K2.

14. Motor and Pump Assembly

The motor and pump assembly (11, fig. 5) is

mounted near the center of the chassis. It consists of a 115-volt, 60-cycle ac, series wound, governor-controlled motor B1 (11, fig. 4), a blower (3) and a pump (12). The blower provides a constant test pressure (or vacuum) to the plenum chamber of the calibration assembly. The pump is a cam-driven reciprocating pump connected to the motor armature shaft through a reduction gear.

15. Calibration Assembly

The calibrator assembly (22, fig. 5) is located behind the front panel between the pressure gage and REJECT light. Calibration is accomplished in the plenum chamber which is divided by a diaphragm. The diaphragm is a thin brass disk with a thin silver disk soldered to its center. The silver disk provides an electrical contact element. The other contact element is at the end of a threaded shaft controlled by the CALIBRATE knob (13, fig. 3), which actuates a high-reduction worm gear for positioning the adjustable element.

16. Power Cord

A 12-foot power cord (3, fig. 1) equipped with a standard female plug at one end and a standard male plug at the other, is provided to connect the indicator to a suitable power supply at the line receptacle connector J3 (8, fig. 5).

17. Solenoid Valve Assemblies

There are four solenoid valves in the indicator. Solenoid valves L1 (19, fig. 5), L2 (18) and L3 (17) are mounted on a bracket adjacent to the motor and pump assembly (11). Solenoid valve L4 (16) is mounted on the chassis base (7).

a. Solenoid Valve L1. Solenoid valve L1 (19) is a two-way valve (normally closed) energized by the PUSH TO CALIBRATE pushbutton switch S2 (6, fig. 3). In the deenergized state, the solenoid valve L1 permits a direct comparison of the leak of the outlet valve under test with the comparison orifice 02 (13, fig. 4). When energized, solenoid valve L1 opens introducing an equivalent air leak to one side of the diaphragm through comparison orifice 01 (16). The comparison orifice 01 is used for calibration purposes and supplies measured air to the opposite side of the diaphragm from the comparison orifice 02 (13)

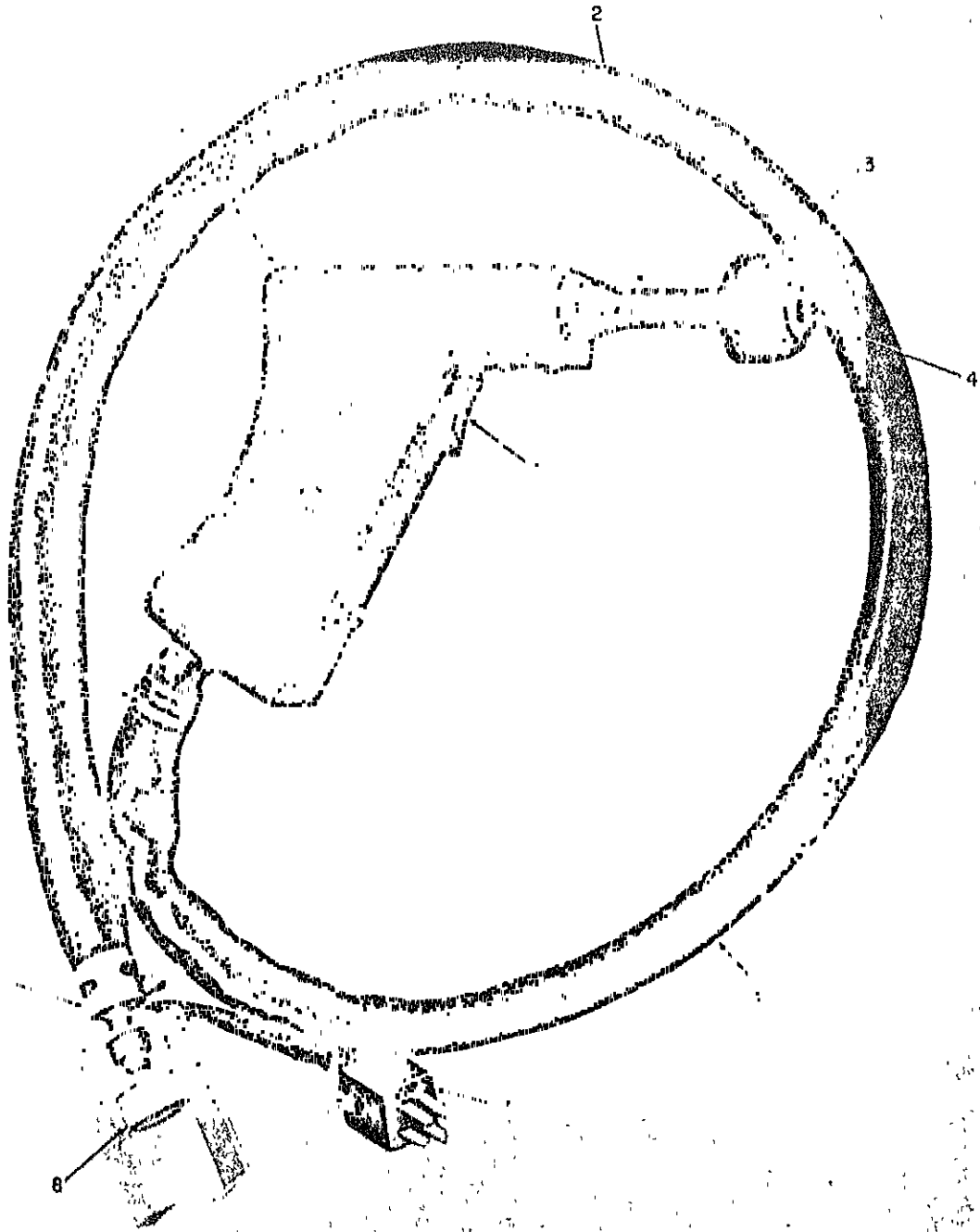
b. Solenoid Valve L2. Solenoid valve L2 (18, fig. 5) is a three-way solenoid valve controlled by the interval timer M1 (4). In the deenergized state, solenoid valve L2 allows a flow of compressed or pulsating air for conditioning the outlet valve under test, prior to leakage testing. When energized, solenoid valve L2 subjects the outlet valve under test to the test pressure for the outlet valve leakage test.

c. Solenoid Valve L3. Solenoid valve L3 (17) is a three-way valve controlled by the mode switch S4 (21, fig. 3) and the interval timer M1 (4, fig. 5). In the deenergized state, solenoid valve L3 passes pulsating air through solenoid valves L4 and L2 to the outlet valve under test. When energized, solenoid valve L3 passes a steady flow of compressed air through solenoid valves L4 and L2 to the outlet valve under test.

d. Solenoid Valve L4. Solenoid valve L4 (16) is a two-way valve (normally open) controlled by the interval timer M1 (4). When energized, solenoid valve L4 closes, isolating the pump (12, fig. 4) prior to the energizing of solenoid valve L2 (18, fig. 5) which initiates the leakage test cycle.

18. Test Probe Assembly

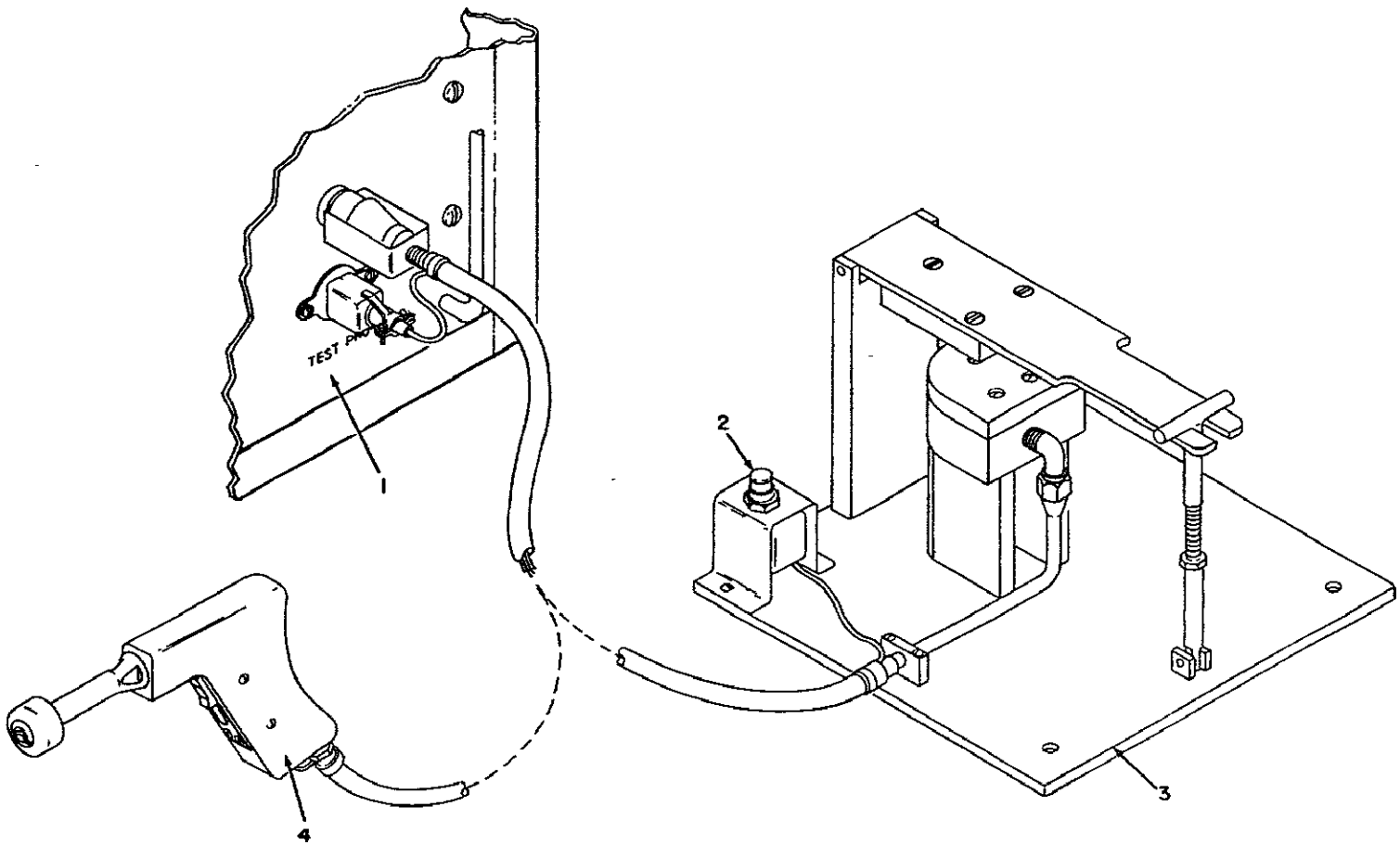
The test probe assembly (fig. 8) is a metal pistol shaped accessory adapted to serve as a means of testing outlet valves which have been installed into facepieces. A rubber tube 36 inches long extends from the butt end of the test probe handle (1) to the mask testing bracket and screw assembly (8). The mask testing bracket is threaded to the screw assembly shaft. This arrangement enables an airtight connection to be made when the bracket and screw assembly are installed onto the VALVE fixture (10, fig. 3) on the front panel. Two wire leads housed in a 42 inch length of electrical insulation sleeving extend from the test probe sensitive switch (5, fig. 8) to the electrical plug connector (7). This plug connector attaches to the TEST PROBE receptacle connector J1 (12, fig. 3) on the front panel (1, fig. 9). Both the rubber tube and electrical insulation sleeving are covered by another larger diameter sleeving (6, fig. 8) 36 inchs long, which is secured at both ends with clamps (9). The test probe barrel



1 Handle
2 Barrel
3 Rubber adapter
4 Mask tip screw
5 Test probe sensitive switch
6 Sleeving
7 Electrical plug connector
8 Mask testing bracket and screw assembly
9 Clamp

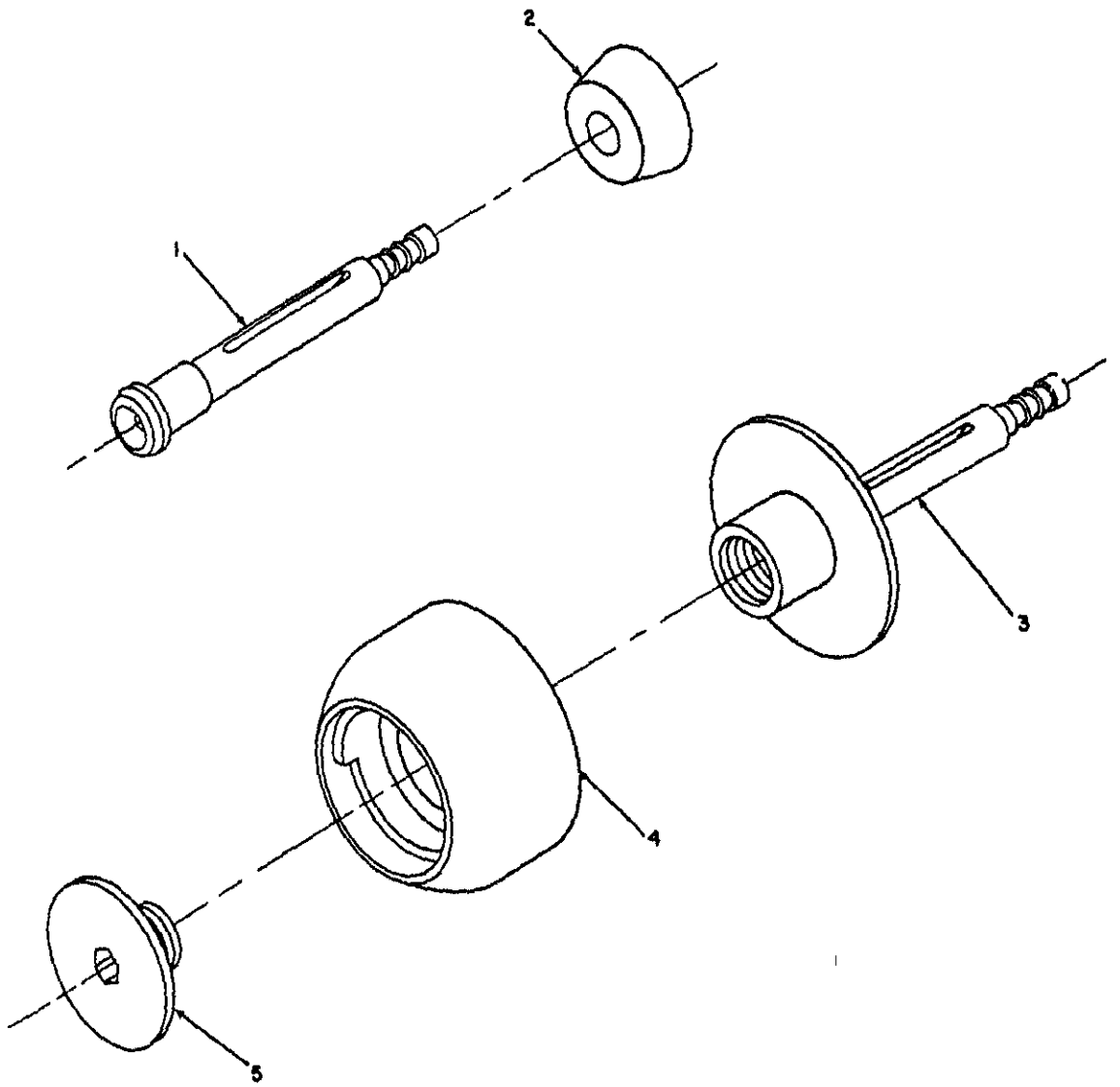
Figure 8. Test probe assembly.

(2) is equipped with a rubber adapter (3) and a mask screw tip (4) to assure an airtight fit to the outlet valve being tested. The test cycle of an outlet valve is initiated by squeezing the test probe trigger which closes the contacts of the test probe sensitive switch (5) when the probe assembly (4, fig. 9) is connected to the TEST PROBE receptacle connector and the VALVE



1 Front panel 2 Pushbutton 3 Holding fixture 4 Test probe assembly

Figure 9. Test probe and holding fixture installation.



1 Type I plunger
Rubber adapter
3 Type II plunger
4 Rubber adapter
5 Retainer

Figure 10. Typical test fixture assemblies.

fixture. Three different rubber adapters (3, fig. 8) may be used with the test probe assembly. Depending on the rubber adapter used, it is necessary to use the matching test probe barrels (2) and mask tip screws (4). Table I indicates the adapter, barrel, and mask tip screw to use for various outlet valves. All rubber adapters are assembled onto the test probe assembly in

the same manner—the rubber adapter is placed over the barrel and secured with the mask tip screw. The other end of the barrel threads into the test probe handle.

19. Test Fixture Assemblies

Several different rubber adapters (fig. 10) are furnished to fit the various outlet valves which can be tested. When testing is done directly on the indicator, the applicable rubber adapter is mounted on either a type I plunger or a type II plunger which fits through the front panel at the VALVE fixture location. Only one rubber adapter is used with the type I plunger. However this rubber adapter fits several different types of outlet valves. Six different rubber adapters are used with the type II plunger and are readily interchanged by removing the retainer which is threaded into the type II plunger to support the rubber adapter. Figure 10 shows how to construct typical test fixture assemblies which are then able to be inserted into the indicator at the VALVE fixture location. Table I indicates the rubber adapter and type of plunger to use in making up the test fixture assembly that is to be used for testing the various types of outlet valves.

20. Calibration Testing Adapters

The calibration testing adapters are used when calibrating the indicator. Because of the variety of rubber adapters used to fit the various outlet valves which are being tested, several different calibration testing adapters are utilized to fit the rubber adapters described in paragraphs 18 and 19 which describe the test probe assembly and test fixture assemblies respectively. Each calibration testing adapter has a 1¼ inch-long length of rubber tubing attached to it. The particular sized pyrex orifice (calibration standard) to be used is selected and then inserted into the open end of the rubber tubing. Table I lists the applicable calibration testing adapter to be used for the outlet valve being tested. Table I also lists the sized pyrex orifices (calibration standards) to be used.

21. Holding Fixture

The holding fixture (3, fig. 9) is used to test the speech diaphragm outlet valves that are assembled in ND Mark V gas masks. The holding fixture is basically a metal baseplate, 10 inches square, on which is mounted a pushbutton sensitive switch, a valve support, and a clamp and locking mechanism. An electrical and air tube assembly, which consists of two wire leads in a 42-inch length of electrical insulation tubing and a rubber tube 36 inches long, both contained in sleeving 36 inches long, connects the holding fixture with a mask testing bracket and screw assembly and an electrical plug connector. When in use, the mask testing bracket and screw assembly connects to the VALVE fixture on the indicator and the electrical plug connector attaches to the TEST PROBE receptacle connector on the front panel. Depressing the pushbutton of the sensitive switch, with a mask facepiece in the holding fixture and the electrical plug connector and bracket and screw assembly connected to the energized indicator, initiates a test cycle.

Section III. USE, IDENTIFICATION, AND TABULATED DATA

22. Use

a. The M4A1 outlet valve leakage indicator (figs. 1 and 2) is used to test air leakage through outlet valves of various gas masks by comparing their leakage with leakage through a calibrated orifice of the indicator. Leakage is checked either under pressure or vacuum.

b. If the outlet valve under test has less than the allowable air leakage, the green colored ACCEPT light (9, fig. 3) on the front panel (18) of the indicator will light signifying acceptance. If the outlet valve under test has more than the allowable air leakage, the red colored REJECT light (8) on the front panel will light signifying rejection. Also if actuated, an electric bell mounted underneath the chassis will ring should the outlet valve being tested fail. The indicator may be used to test outlet valves both which have and have not been assembled into facepieces. Outlet valves can be tested directly on the indicator; outlet valves installed in facepieces are tested using a test probe connected to the indicator. Several test fixture as-

semblies (11) are provided to adapt the indicator to the various outlet valves which can be tested. The plunger of the test fixture assembly fits into the indicator at the VALVE fixture (10) location on the front panel.

c. An outlet valve to be tested is placed over the rubber adapter of the test fixture assembly and the two are pressed in towards the front panel. When the VALVE fixture is pressed, the electrical circuit through the test cycle switch S3, mounted on the back of the front panel, is mechanically closed thereby initiating the automatic, electric-timed test cycle. The time cycle consists of a 2-second conditioning period followed by a 4-second leakage comparison period. When the VALVE fixture is released by the operator, a spring returns it to its normal position thereby opening the contacts of the test cycle switch S3. Outlet valves installed in facepieces are tested with a pistol shaped test probe assembly connected to the indicator. By connecting the electrical plug connector of the probe assembly to the TEST PROBE electrical receptacle connector on the front panel and connecting the mask testing bracket and screw assembly to the VALVE fixture, tests made with the probe assembly can be conducted. With the mask testing tip held tight against the outlet valve in a facepiece and the trigger switch of the probe assembly depressed, the test cycle is initiated as before. The outlet valves used in Mark V ND gas masks require the use of a special holding fixture to test air leakage. This holding fixture is not packaged with the indicator but is shipped in a separate box. It is adaptable to the indicator in the same way as the probe assembly. Instead of a trigger switch, a pushbutton switch mounted on the base of the holding fixture actuates the test cycle. Connection of the test probe assembly and/or the holding fixture to the front panel of the indicator are illustrated in figure 9.

23. Identification

a. Unit Nameplate. The unit nameplate (A, fig. 11) is located on the front panel between the PILOT light and BLEEDER valve control. This plate identifies the equipment and lists the serial number, contract under which it was manufactured, and the manufacturer.

b. Motor Nameplate. The motor nameplate (B), located on top of the motor housing, lists the type of motor, voltage, watts, rating, serial number, and manufacturer.

c. Power Transformer Nameplate. The power transformer nameplate (C), located on top of the power transformer, lists the primary and secondary voltage, the amperage, and manufacturer.

d. Solenoid Valve Nameplates. A nameplate (D) is mounted on the top of each of the four solenoid valves. Each nameplate lists the valve number, voltage, orifice size, operating pressure, watts, serial number, and manufacturer.

24. Tabulated Data

a. Weight.

Crated (in one box)	90 lb (approx)
Uncrated	75 lb (approx)
Cubage	7.2 cu ft

b. Dimensions. (approx.)

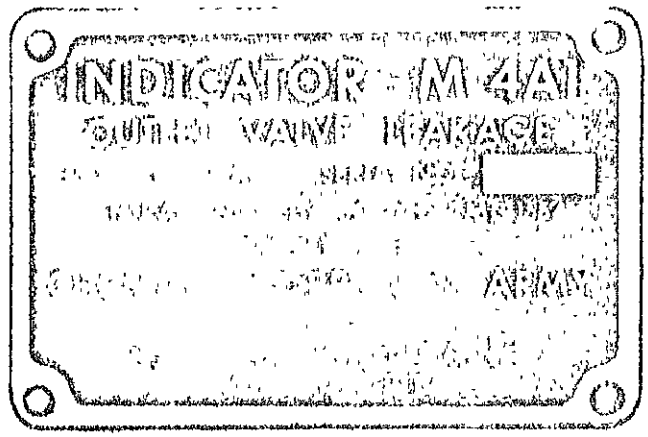
Crated	15½ in. high, 22 in. wide, 28½ in. long
Uncrated	10¾ in. high, 17½ in. wide, 23 in. long

c. Power Requirements.

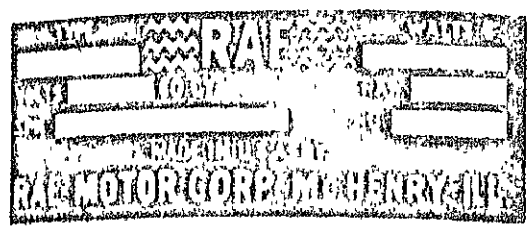
Electrical	115 volts, 60 cps, ac, 1.5 amp
Air supply	65 psi (regulated)

d. Blower Capacity. Pressure or vacuum of 2 inches of water with a leak of 280 milliliters per minute (max).

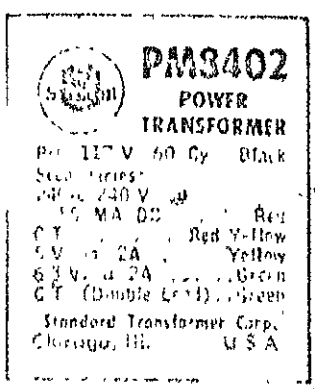
e. Sensitivity. Can be calibrated to indicate a difference in flow of 1 milliliter of air per minute at a pressure or vacuum of 1 inch of water.



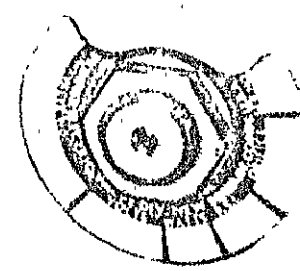
A



B



C



D

A—Unit nameplate
B—Motor nameplate
C—Power transformer nameplate
D—Solenoid valve nameplate

Figure 11. Identification plates.

CHAPTER 2
OPERATING INSTRUCTIONS

Section I. CONTROLS AND INSTRUMENTS

25. General

This section describes, locates, illustrates, and furnishes the operator with sufficient information pertaining to the various controls and instruments provided for the proper operation of the M4A1 outlet valve leakage indicator.

26. Controls

There are 11 controls which are utilized by the operator when using the indicator. In addition, should the test probe assembly or the holding fixture be utilized, controls are provided for their operation.

a. Mode Switch.

(1) *Location.* The mode switch (21, fig. 3) is located on the front panel above the unit nameplate.

(2) *Purpose.* The mode switch is a three-position switch which when in the upper position marked STEADY BLAST will permit a steady blast of air to flow through the VALVE fixture thereby dislodging foreign matter from the component to be tested. The switch is turned to the middle position marked NORM during the test cycle to permit the proper air flow through the VALVE fixture during test. The switch is turned to the lower position marked BLAST TEST to provide a short blast of air before the leakage comparison test.

b. CALIBRATE Knob.

(1) *Location.* The CALIBRATE knob (13) is located on the front panel below the pressure gage.

(2) *Purpose.* The CALIBRATE knob is used to adjust the sensitivity of the calibrator assembly as reflected in the operation of the REJECT and ACCEPT lights.

c. PUSH TO CALIBRATE Pushbutton.

(1) *Location.* The PUSH TO CALIBRATE pushbutton (6) is located on the upper part of the front panel to the left of the pressure gage.

(2) *Purpose.* The PUSH TO CALIBRATE pushbutton energizes solenoid valve L1 permitting air flow into the calibrator assembly so that calibration may be made.

d. PUMP Toggle Switch.

(1) *Location.* The PUMP toggle switch (22) is located on the front panel in the upper left corner.

(2) *Purpose.* This switch operates the motor of the motor and pump assembly and must be in the ON position when operating the indicator.

e. LINE Toggle Switch.

(1) *Location.* The LINE toggle switch (20) is located on the front panel directly below the PUMP toggle switch.

(2) *Purpose.* This switch controls the electrical power to the indicator and must be in the ON position when operating the indicator.

f. Bell Toggle Switch.

(1) *Location.* The bell toggle switch (9, fig. 5) is located on the rear of the chassis assembly between the fuse holder and line connector.

(2) *Purpose.* This switch is wired to the REJECT circuit and when in the ON position, an electric bell will ring should an outlet valve be rejected.

g. Selector Toggle Switch.

(1) *Location.* The selector toggle switch

(9, fig. 4) is located at the rear of the electrical chassis next to the power transformer.

(2) *Purpose.* This switch has a P (pressure) and V (vacuum) position. The switch is placed in the mode of operation to be utilized thereby placing the ACCEPT and REJECT light circuits in the proper mode.

h. Air Shutoff Valve.

(1) *Location.* The air shutoff valve (14, fig. 5) is mounted at the rear of the chassis assembly adjacent to the pump assembly.

(2) *Purpose.* The air shutoff valve is a manually operated valve which when opened permits plant supply air to enter the indicator air supply system. The plant air pressure should be regulated to 20 psig.

i. Selector Valve.

(1) *Location.* The selector valve (2, fig. 4) is mounted to the blower end of the motor and pump assembly.

(2) *Purpose.* This four-way valve is manually operated and is used to select either a pressurized or evacuated system. The valve is marked with a P (pressure) and V (vacuum). Selection of the system to use must be the same as that for the selector toggle switch (9).

j. BLEEDER Valve Control.

(1) *Location.* The BLEEDER valve control (17, fig. 3) is located on the front panel to the right of the unit nameplate.

(2) *Purpose.* This control is used to adjust the pressure or vacuum in the system.

k. VALVE Fixture.

(1) *Location.* The VALVE fixture (10) is located on the front panel below the REJECT and ACCEPT lights.

(2) *Purpose.* The VALVE fixture serves as an attachment for the various test fixture assemblies and directs the test air into the outlet valve being tested. It also closes the contacts of the test cycle switch S3 when pushed in.

l. Test Probe Sensitive Switch.

(1) *Location.* The test probe sensitive switch (5, fig. 8) is located in the handle of the test probe assembly.

(2) *Purpose.* With the test probe assembly connected to the indicator, the test probe trigger when depressed closes the contacts of the sensitive switch and initiates the test cycle.

m. Holding Fixture Pushbutton.

(1) *Location.* The holding fixture pushbutton (2, fig. 9) is located at one corner of the holding fixture baseplate.

(2) *Purpose.* With the holding fixture connected to the indicator, the pushbutton when depressed, closes the contacts in the sensitive switch and initiates the test cycle.

27. Instruments

There are six instruments on the indicator—five are connected in the indicator system while the other is an accessory used when checking the vacuum in the calibrator assembly.

a. Pressure Gage.

(1) *Location.* The pressure gage (7, fig. 3) is located in the center of the front panel.

(2) *Purpose.* The dial-indicating pressure gage is graduated in inches of water from 2.0 to 0 and 0 to 2.0. The gage indicates the vacuum pulled or the pressure applied to the outlet valve being tested.

b. PILOT Light.

(1) *Location.* The PILOT light (19) is located on the lower part of the front panel to the left of the nameplate.

(2) *Purpose.* The PILOT light has a red reflector which lights when the LINE toggle switch is in the ON position indicating power is being supplied to the indicator.

c. ACCEPT Light.

(1) *Location.* The ACCEPT light (9) is located on the upper part of the front panel to the right of the pressure gage.

(2) *Purpose.* The ACCEPT light has a green reflector which lights when the outlet valve being tested is acceptable.

d. REJECT Light.

(1) *Location.* The REJECT light (8) is located on the front panel to the left of the ACCEPT light.

(2) *Purpose.* The REJECT light has a red reflector which lights when the outlet valve has too much leakage and is unacceptable.

e. Electric Bell.

(1) *Location.* The electric bell (8, fig. 6) is located underneath the chassis assembly.

(2) *Purpose.* If an outlet valve fails the leakage test when the bell toggle switch is on, the bell rings indicating rejection.

f. Water Manometer.

(1) *Location.* The water manometer (16, fig. 3) is stowed on the inside of the panel cover assembly (15) at the left.

(2) *Purpose.* When the water manometer is connected to the plug cocks of the calibrator assembly, the vacuum or pressure balance on the two sides of the calibrator diaphragm can be checked.

Section II. OPERATION

28. General

This indicator is a precision instrument. It should always be operated in a protected area free from rain and dust and extremes of temperature.

29. Installation

a. Place the indicator on a bench or table convenient to the plant air and electrical outlets.

b. With the air shutoff valve (14, fig. 5) closed, connect the indicator to the plant air line. (The plant facilities that are required to deliver the necessary air supply are indicated in the indicator airflow diagram, figure 12.)

c. Close the BLEEDER valve control (17, fig. 3) and then open it (back it off) four full turns. Adjust the BLEEDER valve control until the pressure gage reads 1 inch of water (pressure or vacuum as applicable). If the pump has not been operating, allow a 10-minute period to stabilize, and then if necessary, make the final adjustment using the BLEEDER control knob.

d. With the PUMP toggle switch (22) and the LINE toggle switch (20) in the off position, connect one end of the power cord to the line receptacle connector of the indicator and connect the other end of the power cord to the plant facility 115-volt, 60-cycle ac power supply outlet.

***Warning:* The indicator is energized from an external power source with 120 volts ac, but through the power transformer T1 of the indicator 600 volts ac is present in the electron tube circuit. These leads are fastened to bare terminals. Before changing orifices or opening the cabinet lid, disconnect the power cord.**

e. Check to see that the applicable comparison orifices 01 (16, fig. 4) and 02 (13) and the applicable balance orifices 03 (2, fig. 5) and 04 (1), required while testing the particular outlet valve as listed in table I, have been installed in the indicator.

f. Mount the applicable test fixture assembly, required while testing the particular outlet valve as listed in table I, at the VALVE fixture (10, fig. 3) location. (If performing the calibration procedure (par. 39*b*), mount the applicable lower limit calibration standard listed in table I in the calibration testing adapter with the arrow in the direction of air flow. Remember that the direction of the airflow is dependent upon the mode of operation (pressure or vacuum). When testing components using the test probe assembly, the indicator must be calibrated with the calibration standard attached to the end of the test probe assembly.

Note. The test fixture assembly is assembled as shown in figure 10. The component parts of the test fixture assemblies are listed in table I. Type I plungers require only the applicable rubber adapter; type II plungers required both the applicable rubber adapter and a retainer to fasten the rubber adapter to the plunger.

g. If required, connect the test probe assembly (fig. 8) to the indicator with the applicable rubber adapter, listed in table I, by plugging the plug connector into the TEST PROBE elec-

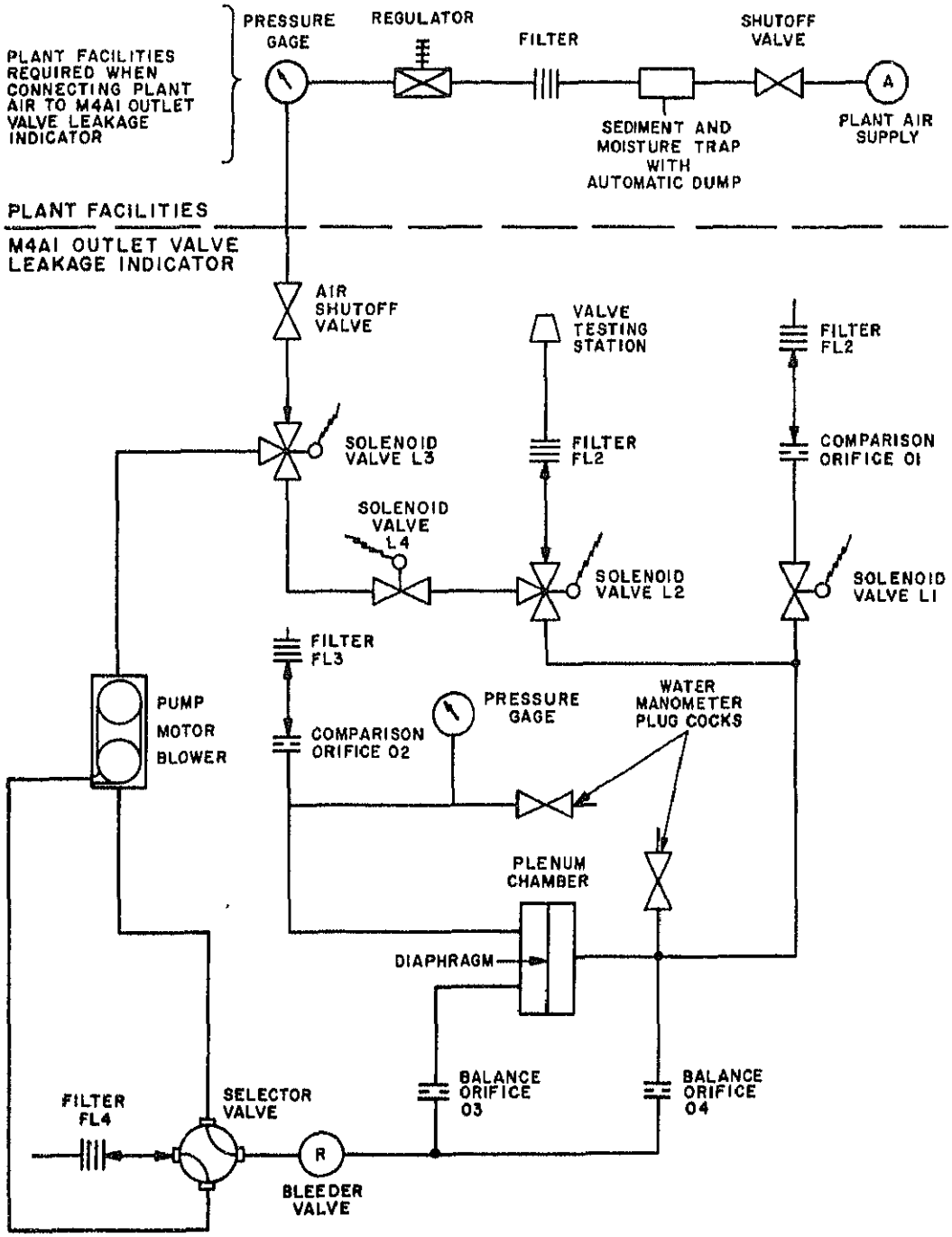


Figure 18. Indicator airflow diagram.

trical receptacle connector (12, fig. 3) and connecting the mask testing bracket and screw assembly over the VALVE fixture. Tighten the screw assembly to obtain an airtight seal.

h. If the outlet valve to be tested requires the use of a holding fixture, both the holding fixture to a level surface convenient to the indicator.

i. Set the selector valve (2, fig. 4) for the

proper mode of operation (pressure or vacuum) as indicated in table I. This setting is made by turning the valve handle so that it is alined over the desired letter (P or V) appearing on the base of the valve. Move the selector toggle switch (9) to th P or V position in agreement with the selector valve position.

Caution: **Take the probe assembly off the inside of the cabinet lid and set it aside while operating the indicator. This will prevent it from accidently falling off during operation and perhaps damaging the indicator.**

j. Perform the before-operation services given in paragraph 39.

30. Operation

a. Place the LINE toggle switch (20, fig. 3) in the ON position and observe that the PILOT light (19) on the front panel is lit.

b. Place the PUMP toggle switch (22) in the ON position.

c. Check to see that the plant facility air supply pressure regulator has been set at approximately 20 psig as read on the pressure gage provided (fig. 12). Open the air shutoff valve (14, fig. 5).

d. Inspect to see that the pressure gage (7, fig. 3) reads 1 inch of water (pressure or vacuum as applicable). If necessary, readjust using the BLEEDER valve control (17).

e. Inspect to see that the mode switch (21) is in the NORM position.

Note. The BLAST TEST and STEADY BLAST positions of the mode switch normally are not used, but when it is necessary to use them, they are utilized for removing dust particles from the outlet valve under test. The BLAST TEST position allows a 1¾-second blast of air through the indicator for purging purposes. The same 1¾ seconds of time are used in the NORM position for the same purging purpose (or outlet valve conditioning cycle). This is then followed by the leakage comparison test period. The STEADY BLAST position allows the outlet valve under test to be subjected to the compressed air until the mode switch is turned to the NORM position.

f. When the outlet valve to be tested can be mounted on the VALVE fixture (10), proceed as follows:

(1) Place the outlet valve under test on the applicable test fixture assembly and press in at the VALVE fixture to start the test cycle.

(2) Observe to see that the REJECT light (8) and/or the ACCEPT light (9) lights up. If the outlet valve is acceptable, the ACCEPT light will light in 2 seconds. If the outlet valve is defective, the REJECT light will light after more than 2 seconds of time have elapsed—anytime during the remaining 4 seconds being run off by the interval timer.

Note. If an audio reject alarm is desired along with the visual reject light signal, place the bell toggle switch (9, fig. 5) in the on position.

(3) Retest all rejects. Place the mode switch in either the STEADY BLAST or BLAST TEST position. Inspect to see that the selector valve (2, fig. 4) and the selector toggle switch (9) are in the V or vacuum position. Perform this additional test to ensure that the rejection was not a result of dirty outlet valves.

Caution: **Never use the STEADY BLAST or BLAST TEST positions when the mode of operation is pressure. Do not remove the outlet valve under test from the VALVE fixture during the test cycle. Damage to the indicator will result.**

g. When testing outlet valves that have been installed in gas masks, the test probe assembly or the holding fixture (fig. 9) is used. Proceed with testing as follows:

(1) With the test probe assembly (or the holding fixture) correctly assembled to the indicator, insert the rubber adapter (3, fig. 8) into the component undergoing test. Take care to seat it correctly to insure an airtight seal. Press the trigger of the test probe sensitive switch (5) to start the test cycle.

(2) Perform the steps in *f*(2) and (3) above to complete this test procedure.

31. Shutdown

a. Place the PUMP toggle switch (22, fig. 3) in the off position.

b. Close the air shutoff valve (14, fig. 5), and turn the mode switch (21, fig. 3) to the STEADY BLAST position to bleed the system.

c. Place the LINE toggle switch (20) in the off position.

d. Disconnect the power cord from the power source.

e. Stow all accessories for safe keeping and turn in all tested outlet valves for reissue. Complete all records and logbook entries.

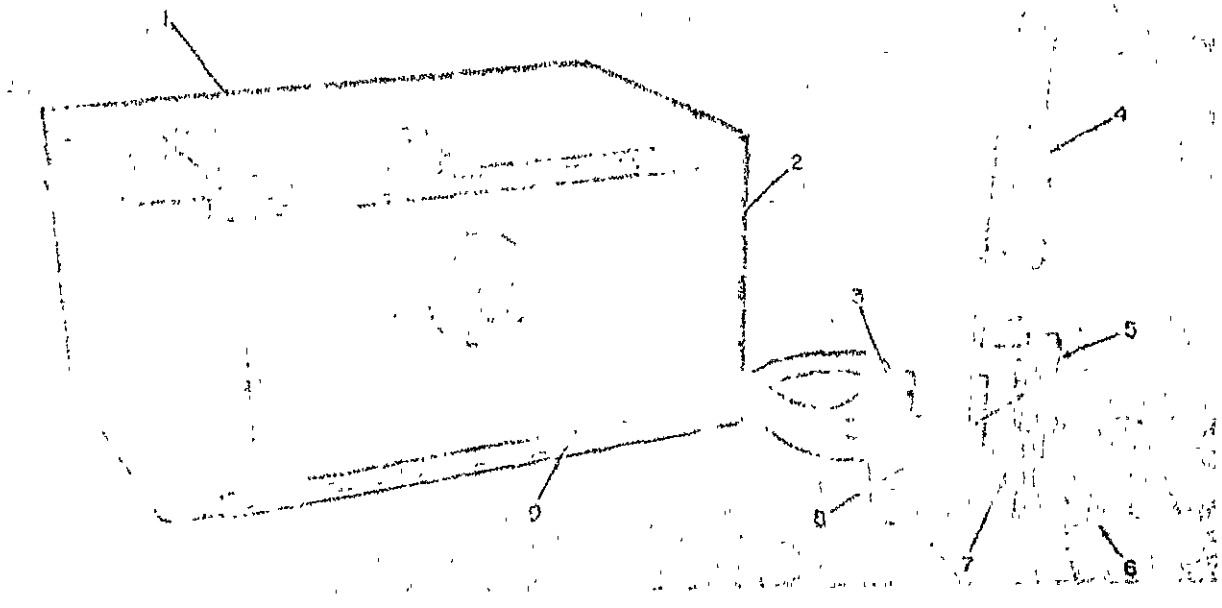
Section III. OPERATION OF HOLDING FIXTURE USED IN CONJUNCTION WITH THE M4A1 OUTLET VALVE LEAKAGE INDICATOR

32. Description

The holding fixture (7, fig. 13) is usd to support the outlet valve of the ND Mark V gas mask while subjecting it to the air leakage test applied by the indicator. It consists of a baseplate (6) valve support (5) with tubing and connectors, clamp and locking mechanism (4), sensitive switch (3), plug connector (9), and mask testing bracket and screw assembly (2). It measures approximately 10 inches wide, 10 inches deep, and 6¼ inches high.

33. Operation

The outlet valve is placed on the valve support (5, fig. 13) and secured by the clamp and locking mechanism (4). The clamp is pivoted down onto the outlet valve and locked in place by an adjustable arm (8) which fits in a slot in the clamp. With the outlet valve fastened securely in the holding fixture (7), connect the plug connector (9) to the TEST PROBE electrical receptacle connector (12, fig. 3) of the indicator (1, fig. 13) and the mask testing bracket and screw assembly (2) to the VALVE fixture. The test on the outlet valve then is accomplished as described in paragraph 30 except the holding fixture pushbutton of the sensitive switch (3) is pressed to initiate the test cycle.



1 M4A1 outlet valve leakage indicator
2 Mask testing bracket and screw assembly
3 Sensitive switch
4 Clamp and locking mechanism
5 Valve support
6 Baseplate
7 Holding fixture
8 Adjustable arm
9 Plug connector

Figure 13. Holding fixture connected to M4A1 outlet valve leakage indicator.

CHAPTER 3
OPERATOR'S MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

34. Tools

Special tools are not required by the operator for maintenance of the indicator.

35. Equipment

Special equipment is not required by the operator for maintenance of the indicator.

Section II. LUBRICATION

36. General

No lubrication is required to the indicator other than to the pump on the motor and pump assembly.

37. Lubrication Points

When the equipment is in constant use, refill the oil cup on the pump cylinder of the pump (13, fig. 5) once a month with light machine oil.

Section III. OPERATOR'S PREVENTIVE MAINTENANCE SERVICES

38. General

The operator of the indicator is responsible for regular performance of preventive maintenance services to insure that the indicator operates properly and to lessen the possibility of failures. These services generally consist of before-, during-, and after-operation services, and regularly scheduled services. Intervals of maintenance are based on normal operations and may be reduced or extended depending upon the operating conditions.

39. Before-Operation Services

The purpose of before-operation services is to determine whether the indicator is in good operating condition. Deficiencies must be corrected or reported to organizational maintenance personnel for correction before the equipment is placed in operation.

a. *Visual Inspection.* Make a thorough inspection of the indicator and check for loose or missing nuts and bolts. When necessary, tighten or replace hardware. Inspect the indicator to see that all parts are present. Examine all hose and tubing for wear, cracks, holes, and deterioration. Inspect the power cord and other wires for damaged insulation and loose connections. Make certain that an air supply regulated down to 20 psig is available and that plant facilities similar to those indicated in figure 12 are available for hookup to the air shutoff valve.

b. *Calibration Test.*

(1) *General.* The calibration setting is an extremely critical adjustment. To assure proper operation of the indicator, it should be performed at least once every day of operation, after replacement of parts, after changeover of orifices of different scales, and before using the test probe assembly or the holding fixture. After every 90 days of use, the sized pyrex orifices should be replaced with new standards to assure maximum accuracy. A record of each calibration test should be entered on a tag. The tag should be attached to the indicator for safekeeping. This entry should include the date of the test, the results of the test, and the signature of the person performing the test.

(2) *Procedure.*

(*a*) Follow the steps outlined in paragraph 29.

(*b*) Turn the mode switch (21, fig. 3) to the NORM position.

(*c*) Place the LINE toggle switch (20) to the ON position. The PILOT light (19) should glow.

(*d*) Depress and hold the PUSH TO CALIBRATE pushbutton switch (6). Either the green ACCEPT light (9) should glow in two seconds or the red REJECT light (8) should glow after more than two seconds of time have elapsed—anytime during the remaining four seconds being run off by the interval timer.

Note. If neither the red nor the green light goes on when the PUSH TO CALIBRATE pushbutton switch is depressed, stop the calibration procedure until troubleshooting corrects the malfunction.

(*e*) If the green ACCEPT light (9) glows, unlock the shaft lock on the CALIBRATE knob (13), and turn the knob until the red REJECT light (8) flickers, remembering to keep the PUSH TO CALIBRATE pushbutton swtich (6) depressed.

***Caution:* The direction of the CALIBRATE knob must be turned is affected by the mode of operation (pressure or vacuum). For vacuum operation, the CALIBRATE knob will be turned counterclockwise to adjust toward "reject". For pressure operation, the CALIBRATE knob will be turned clockwise to adjust toward "reject". Continue to turn the CALIBRATE knob until the red REJECT light (8) just remains on steadily. Release the PUSH TO CALIBRATE pushbutton switch (6), and lock the CALIBRATE knob (13) by locking the shaft lock.**

(*f*) If the red REJECT light (8) glows when the PUSH TO CALIBRATE pushbutton switch (6) is depressed, unlock the shaft lock and adjust the CALIBRATE knob (13) toward "accept" (clockwise for vacuum operation-counterclockwise for pressure operation) until the green ACCEPT light (9) goes on. Then slowly turn the CALIBRATE KNOB (13) back the other way until the red REJECT light (8) flickers and then remains on. Release the PUSH TO CALIBRATE pushbutton switch (6) and lock the CALIBRATE knob (13) by locking the shaft lock.

***Caution:* Do not turn the CALIBRATE knob any further than is necessary to keep the red REJECT light on without flickering.**

(*g*) Place the PUMP toggle switch (22) in the ON position.

(*h*) Adjust the BLEEDER valve control (17) until the pressure gage (7) reads 1 inch of water (pressure or vacuum as applicable). If the pump has not been operating, allow a 10-minute time period for the pump to stabilize, and, if necessary, readjust the BLEEDER valve control (17) at the end of the expired time period.

(*i*) Select the applicable rubber adapter listed in table I and mount it on the matching type I or type II plunger is shown in figure 10. (This then becomes the test fixture assembly.)

(*j*) Inside the indicator, pull the rubber tube from the end of the test valve plunger and loosen two setscrews in the test valve collar and one setscrew in the test valve bushing. Pull the plunger with the test valve adapter on it from the VALVE fixture. The test valve sleeve and spring also come off with jt. Remove four screws in the test valve flange and remove the flange and test valve bushing.

(*k*) Install the test fixture assembly by positioning the test valve bushing and test valve flange on the front panel, and securing the bushing and flange in place with four screws. Insert the test fixture assembly into the valve sleeve and through the test valve spring. Install the test fixture

assembly with these components into the test valve bushing and the test valve flange. Aline the slot of the plunger shaft with the setscrew in the test valve bushing and screw the setscrew into the slot. Install the test valve collar over the end of the test fixture assembly and, with the test fixture assembly retracted and the collar against the test valve flange, tighten the two setscrews. Install the rubber tube over the end of the test valve plunger.

(*l*) Mount the applicable lower limit sized pyrex orifice (calibration standard), listed in table I, in the calibration testing adapter, with the arrow pointing in the direction of the flow. Remember that the direction of the air flow is dependent upon the mode of operation (pressure or vacuum). Then press the calibration testing adapter on the VALVE fixture.

Note. When testing outlet valves with the test probe assembly (4, fig. 9) or holding fixture (3) the indicator must be calibrated with the calibration standard attached to the test probe assembly or the holding fixture.

(*m*) Push in on the VALVE fixture (10, fig. 3) to start to test cycle. The green ACCEPT light (9) should go on within 2 seconds.

(*n*) Replace the applicable lower limit sized pyrex orifice (calibration standard) with the applicable upper limit sized pyrex orifice (calibration standard), listed in table I.

(*o*) Again push in on the VALVE fixture (10) to start the test cycle. The red REJECT light (8) should go on after more than 2 seconds of time have elapsed—anytime during the remaining 4 seconds being run off by the interval timer.

***Caution:* If the lights fail to go on, slight adjustment of the CALIBRATE knob (13) may be necessary while alternately using the upper and lower limit calibration standards. When the indicator accepts the lower limit standard and rejects the upper limit standard, it is in calibration.**

(*p*) Remove the test fixture assembly from the VALVE fixture of the indicator. Disassemble the sized pyrex orifices from the calibration testing adapters and stow these accessories for reuse.

40. During-Operation Services

The purpose of during-operation services is to make certain the indicator remains in satisfactory working order while being operated. As an integral part of the operation of the indicator, a general inspection of the unit must be continued at all times.

a. General Inspection. Maintain a constant general inspection of all components of the indicator. Inspect to see that there are no leaks, loose fittings, unusual noises or odors, abnormal instrument indications or malfunctions, or any other incorrect condition. If any deficiency discovered by the operator cannot be corrected by the operator, shut down the indicator and report the deficiency to organizational maintenance personnel.

b. Calibration Test. Perform the calibration test described in paragraph 39*b* once every day of operation, after replacement of parts, after changeover of orifices of different scales, before using the test probe assembly, or before using the holding fixture.

41. After-Operation Services

The purpose of after-operation services is to make certain the equipment will be in proper working condition at all times. Correct all deficiencies within the capabilities of the operator. Report all other deficiencies to organizational maintenance personnel.

a. Visual Inspction. Inspect the indicator components for damage. Examine for loose or missing parts. Tighten loose fittings and connectors. Correct deficiencies or report them to organizational maintenance personnel.

b. Accessories. Inspect all accessories to make certain that all items required are accounted for and in good condition.

42. Preventive Maintenance Checklist

a. Purpose. The Preventive maintenance checks and services provides the operator with a list of maintenance services which must be performed at prescribed intervals and prescribes the intervals. Use the list each time that preventive maintenance checks and services are performed in order to make sure that all required maintenance is accomplished. If corrective action is not authorized at first echelon level report equipment faults to organizational maintenance personnel.

b. Explanation of Columns. A number under the before-, during-, or after-operation heading in the "Interval and Sequence No." column indicates that the services opposite the number must be performed at the prescribed time. The number indicates the sequence in which the service must be performed and is the "TM Item No." referred to on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) (TM 38–750).

Preventive Maintenance Checks and Services

1st echelon daily schedule

Interval and sequence No.			Item to be inspected	Procedure	Paragraph reference
Before-operation	During-operation	After-operation			
1		22	Panel cover	Inspect condition of components	
2	15	23	Water manometer	Inspect for condition	
3		24	Calibration testing adapters.	Check for presence and condition	
4	16		Front panel controls and markings.	Check for operation of controls and legibility of markings.	
5	17	25	Pressure gage	Check for operation and condition	
6		26	Holding fixture	Check for presence and operation	
7		27	Rubber adapters and plungers.	Check for presence and condition	
8		28	Chassis assembly	Inspect for condition of components. Tighten fittings and connections as required.	
9		29	Fuse	Check for condition	
10	18	30	Electron tube	Check mounting operation	
11	19	31	Motor and pump assembly.	Check general condition and oil level in pump cylinder.	37
12		32	Cabinet assembly	Check for condition	
13		33	Test probe assembly	Check for condition and operation	18
14	20		Calibrator	Check calibration of indicator	39*b*
	21		Performance	Check for unusual noises or odors	
		34	Shutdown precautions	Observe all steps in shutdown procedure	31
		35	Protection	Close cabinet lid and replace panel cover	

Section IV. TROUBLESHOOTING

43. General

This section provides information useful in locating and correcting some of the causes of unsatisfactory operation or failure of the indicator. Each malfunction is followed by a description of probable causes and possible remedies. Remedies which must be applied by higher echelon maintenance personnel include a note to this effect.

44. Indicator Does Not Operate

Probable cause	*Possible remedy*
LINE toggle switch not in ON position	Place Line toggle switch in ON position
LINE toggle switch defective	Report to organizational maintenance personnel
Fuse burned out or contacts dirty	Report to organizational maintenance personnel
Poor line connection	Connect power cord to electrical source and to line receptacle connector. Check line connecting terminals.
Electron tube inoperative	Report to organizational maintenance personnel
Motor and pump assembly inoperative	Report to organizational maintenance personnel

45. Pilot Light Does Not Light

Probable cause	*Possible remedy*
Pilot lamp loose or burned out	Tighten. If replacement is required, report to organizational maintenance personnel.
LINE toggle switch off or defective	Place switch in ON position. If replacement is required. report to organizational maintenance personnel.
Fuse burned out or contacts dirty	Report to organizational maintenance personnel
Poor line connection	Check power cord connections

46. Erratic Indications

Probable cause	*Possible remedy*
Loose or dirty electrical connections	Tighten or clean connections
Open plug cocks	Close plug cocks (pressure gage reading should stabilize at 1 inch of water indication).
Accept or reject lamps loose	Tighten loose lamp
Leak in vacuum system	Report to organizational maintenance personnel
Defective electron tube	Report to organizational maintenance personnel

47. Indicator Cannot Be Calibrated

Probable cause	*Possible remedy*
Leakage around adapter assembly	Reinstall or replace adapter assembly (par. 19)
Incorrect test orifices	Install proper sized orifices (par. 7b)
Dirty orifices	Report to organizational maintenance personnel
Probe assembly leaks	Reinstall or replace probe assembly (par. 18)
Solenoid valve defective	Report to organizational maintenance personnel
Leak in vacuum system	Report to organizational maintenance personnel

48. Test Cycle Incomplete

Probable cause	*Possible remedy*
Keying relay K2 or holding relay K1 contacts fail to operate.	Report to organizational maintenance personnel

CHAPTER 4
ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

49. New Equipment

a. General. The indicator is shipped in a wooden crate (fig. 14). The shipping container is reusable and should not be destroyed. The various adapters required are shipped separately in an individual carton. The holding fixture also is shipped in an individual carton.

b. Unpacking.

(1) Use a crowbar or other appropriate tool and pry the lid from the shipping crate (4, fig. 15). Remove the top of the crate and open the cardboard carton (1).

(2) Remove the filler material (2) surrounding the indicator.

(3) Lift the indicator, wrapped in waterproof barrier material (3) from the crate.

(4) Remove the protective material that covers the indicator.

(5) Install the top in the crate and stow the shipping crate for future reuse.

(6) Open the two individual cartons. The one carton contains the selection of test fixture assemblies. The other carton contains the holding fixture

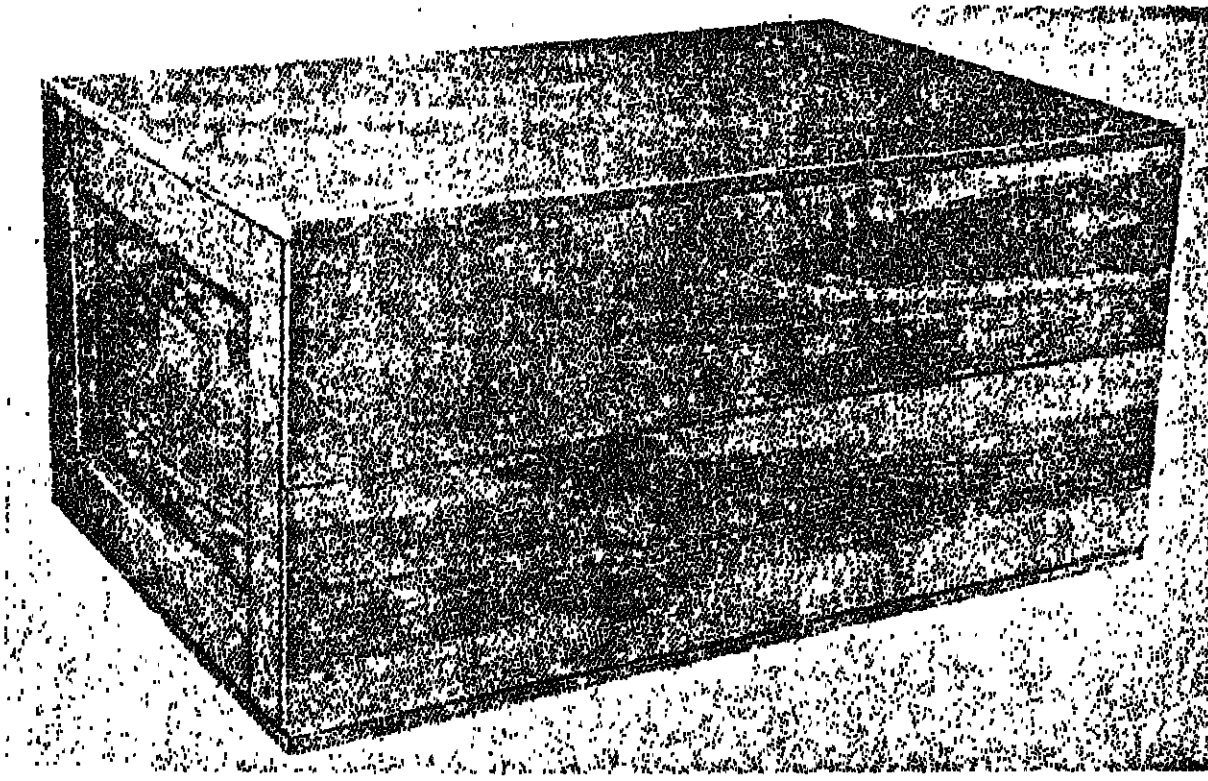


Figure 14. Indicator shipping crate.

which is used in support of the ND Mark V gas mask.

50. Used Equipment

a. General. Used equipment will be packaged in the same manner as new equipment and in the same type of shipping container since shipping containers are reusable. Handle the equipment in accordance with paragraph 49.

b. Inspection. Perform the following inspections to make certain that the indicator is ready for operation. Be sure that any deficiencies noted are corrected prior to using the equipment.

(1) Inspect to see that the cabinet assembly is free of dents and cracks. Inspect to see the cabinet lid and panel cover are intact and latch properly.

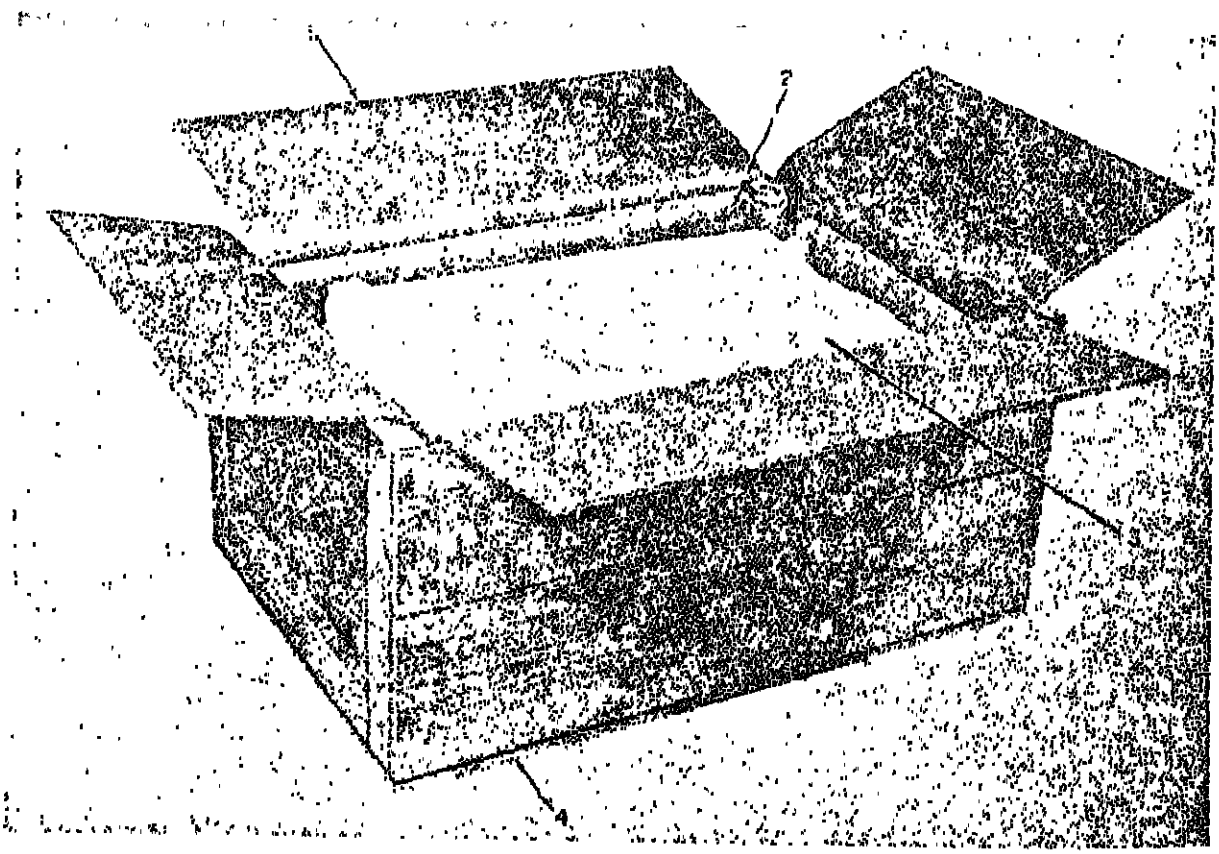
(2) Remove the panel cover and inspect the condition of the front panel components and the accessories stowed on the panel cover.

(3) Inspect to see that the hose assemblies, wiring, electrical connectors, and electron tube are free of breaks, wear, dirt, and loose or missing connecting points.

(4) Inspect the mechanical parts for proper mounting and seating of hardware. Inspect the connectors for shape and condition of threads. Inspect the copper tubing for dents, breaks, punctures and overall condition.

(5) Inspect the handles of the cabinet assembly to see that they are securely mounted.

(6) Inspect to see that all components are in good repair and that no parts are missing.



1 Cardboard carton 2 Filler material 3 Waterproof barrier material 4 Shipping crate

Figure 15. Packing of the indicator.

Section II. SPECIAL TOOLS AND EQUIPMENT

51. Tools

No special tools are required to perform the maintenance operations on the indicator authorized in the maintenance allocation chart for organizational maintenance personnel.

52. Equipment

No special equipment is required to support organizational maintenance operations on the indicator.

Section III. LUBRICATION AND PAINTING

53. General Lubrication Information

No lubrication is required to the indicator other than that cited in paragraph 37.

54. General Painting Information

Second echelon maintenance personnel are authorized to retouch the paint on the indicator. When necessary, thoroughly clean the surface and repaint. Refer to TM 9-213 for general instructions for cleaning and methods of painting.

55. Paints to be Used

a. Primer. Prime all worn and scratched surfaces with one coat of synthetic paint primer.

b. Enamel. Touch up exterior surfaces with one coat of black wrinkle paint. Mark the outside of the cover panel assembly with the word TOP in ½-inch high letters plus an arrow 3 inches long and ½ inch wide using red paint.

Section IV. ORGANIZATIONAL PREVENTIVE MAINTENANCE SERVICES

56. General

The instructions contained in this section apply to the second echelon maintenance personnel responsible for maintaining the indicator. The purpose of preventive maintenance services is to detect the first signs of failure of components and to insure that appropriate corrective action is taken before expensive and time-consuming repairs or replacements are required.

57. Preventive Maintenance Checks and Services

a. Purpose. The preventive maintenance checks and services provides organizational maintenance personnel with a list of maintenance services which must be performed at prescribed intervals and prescribes the intervals. Use the list each time that organizational preventive maintenance checks and services are performed in order to make sure that all required maintenance is accomplished. If corrective action is not authorized at organizational level, report equipment faults to field maintenance personnel.

b. Expanation of Columns. A number under the weekly or monthly heading in the "Interval and Sequence No." column indicates that the service opposite the number must be performed weekly or after 60 hours of operation; monthly services, monthly or after 240 hours of operation whichever occurs first. The number indicates the sequence in which the service must be performed and is the "TM Item No." referred to on DA Form 2404 (TM 38-750).

2nd echelon weekly and monthly services

Interval and sequence No.		Item to be inspected	Procedure	Paragraph reference
Weekly	Monthly			
1		Lines, valves, and fittings	Inspect for damage	
2		Rubber hose and grommets	Inspect for condition	
3		Electrical insulation and contacts	Inspect for condition	
4		Terminal boards	Inspect for condition	
5		Filters	Clean and service	68
6		Pressure gage	Check operation	
7		Motor and pump assembly	Check shaft movement	
	9		Check motor speed	72
8		Cabinet	Check overall condition	
	10	Electric bell	Check operation	
	11	Air shutoff valve	Check operation	
	12	VALVE fixture	Check return action of spring	
	13	Calibrator	Check action of diaphragm	39b
	14	Wiring diagram	Check legibility	
	15	Vacuum diagram	Check legibility	

Section V. TROUBLESHOOTING

58. General

This section provides information useful in locating and correcting causes of unsatisfactory operation or failure of the indicator. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy is described opposite the probable cause. Remedies which must be applied by third echelon maintenance personnel include a note to this effect.

59. Motor and Pump Assembly Does Not Operate

Probable cause	*Possible remedy*
PUMP toggle switch not in ON position	Place PUMP toggle switch in ON position
PUMP toggle switch defective	Report to field maintenance personnel
Wiring circuit defective	Report to field maintenance personnel
Pump and motor assembly defective	Report to field maintenance personnel

60. Vacuum System Unstable

Probable cause	*Possible remedy*
Leakage in vacuum system	Systematically isolate section of the vacuum system and apply a slight vacuum to each section. Connect a water manometer in such a way that the vacuum supports a water column in the manometer. If leaks are present, the water column will gradually drop to balance the other column on the scale. Report to field maintenance personnel.

61. Electron Tube Does Not Light

Probable cause	*Possible remedy*
Defective tube	Replace tube (par. 67)
Loose or unsoldered socket connections	Report to field maintenance personnel

62. Solenoid Valves Inoperative

Probable cause	*Possible remedy*
Defective solenoid valve	Report to field maintenance personnel
Worn valve seat	Report to field maintenance personnel
Stuck or dirty valve	Report to field maintenance personnel

63. Timer Inoperative

Probable cause	*Possible remedy*
Defective timer	Report to field maintenance personnel

64. Calibrator Inoperative

Probable cause	*Possible remedy*
Oxidation of diaphragm switch S1 contacts	Remove terminal on calibrator housing and connect megohmmeter into diaphragm switch circuit. Turning the CALIBRATE knob to the right or left should produce a clear response on the megohmmeter scale. Erratic readings may be due to oxidized contacts. If diaphragm has to be replaced, report to field mainteance personnel.

Section VI. CHASSIS GROUP

65. Chassis Assembly

a. Description and Function. The chassis assembly contains all the components of the indicator with the exception of the cabinet assembly, the panel cover assembly, and the various accessories. Actual operation of the indicator could be accomplished with just the chassis assembly.

b. Removal.

(1) Make sure that the indicator is shut down and then disconnect the power cord and the plant air supply from the indicator. Pull the panel cover assembly (15, fig. 3) from the front panel (18) of the chassis assembly.

(2) Remove the four capscrews which secure the front panel to the cabinet assembly (5).

(3) By means of the handles on the front panel, pull the chassis assembly from the cabinet assembly.

c. Installation.

(1) After determining that the chassis assembly is satisfactory, position the chassis assembly (fig. 5) in the cabinet assembly (5, fig. 3) and slide it into place.

(2) Orient the chassis assembly in the cabinet assembly (5) so that the threaded holes in the cabinet are alined with the slots in the front panel.

(3) Secure the front panel to the cabinet assembly with four capscrews.

(4) Position the panel cover assembly (15) on the front panel (18) and press it in place.

(5) Connect the plant air pressure and electrical power supplies to the indicator.

66. Electric Chassis Assembly

a. Description. The electric chassis assembly (6, fig. 5) is mounted on the chassis base (7) of the chassis assembly and supports several of the electrical components including the timers, electron tube, power transformer, and relays.

b. Removal.

(1) Remove the chassis assembly (par. 65*b*).

(2) Disconnect the wire terminals leading to the electric chassis assembly (6, fig. 5) at terminal board TB1 (10, fig. 4). All 16 of these terminals are mounted on a plastic strip so that when disconnected from the terminal

board, the wires do not become disarranged.

(3) Unsolder the two wires leading to the interval timer (4, fig. 5). Mark these two wires to assure proper order when reassembling.

(4) Remove fours crews and lockwashers that secure the electrical chassis to the four spacers mounted on the chassis assembly.

(5) Lift the electric chassis assembly (6) from the four spacers.

c. Installation.

(1) Position the electric chassis assembly (6) on the four spacers of the chassis assembly.

(2) Secure the electric chassis assembly to the chassis assembly with four lockwashers and screws.

(3) Connect and solder the two wires to the interval timer (4).

(4) Insert all 16 wire terminals that are mounted on the plastic strip under their respective screws on terminal board TB1 (10, fig. 4). Tighten the screws.

(5) Install the chassis assembly (par. 65c).

67. Electron Tube

a. Description. The electron tube (7, fig. 4) is a standard 6J5GT triode electron tube type. It is equipped with pins and a keying device which enables it to connect with the octal socket that is attached by hardware to the electrical chassis. The octal socket has wires attached to its terminal connecting the socket pins permanently into the electrical circuit. The electron tube consists of a plate, a grid, a cathode, and a filament heater.

b. Removal.

(1) Make sure the indicator is shutdown and disconnect the power cord from the power source.

Note. If the indicator has been in operation, allow the electron tube to cool.

(2) Open the lid of the cabinet assembly (5, fig. 3) and pull the electron tube (7, fig. 4) from its socket. It may be necessary to work the tube back and forth while exerting a pulling force.

c. Installation.

(1) Aline the key index of the new electron tube (7) with the octal socket index and pins.

(2) Insert the electron tube into the socket. Be sure the electron tube is completely seated.

(3) Connect the power cord to the line receptacle connector at the back of the chassis base and plug the other end of the power cord into the 115-volt, 60-cycle, single phase, ac power supply. Place the Line toggle switch (20, fig. 3) in the ON position. After a 5-second delay, the electron tube should light.

(4) Close the lid of the cabinet assembly.

68. Orifice Filters

a. Description and Function. Four orifice filters are located at critical points within the indicator to filter all test air entering the system. Filter FL1 (17, fig. 4) filters the air in the line between the solenoid valve L2 (18, fig. 5) and the VALVE fixture (10, fig. 3). Filter FL2 (15, fig. 4) filters the air supplied to the solenoid valve L1 (19, fig. 5). Filter FL3 (14, fig. 4) filters the air leading to the contact side of the sensitive diaphragm switch (20) and the pressure gage (7, fig. 3). Filter FL4 (1, fig. 4) filters the air supplied to the blower (3) of the motor and pump assembly.

b. Removal.

(1) Disconnect the power cord from the power source if filters FL1 (17) or FL4 (1) are to be replaced, lift the cabinet lid (3, fig. 3). Filters FL2 (15, fig. 4) and FL3 (14) are accessible from the rear of the cabinet.

(2) Remove six screws (1, fig. 16) and lockwashers (2) which secure the filter cap (3) and the orifice filter (4) to the orifice housing (5).

Note. All filters except filter FL1 are secured with a filter cap. The filter FL1 i

retained by a filter holder. Filters FL2 and FL3 are mounted over orifice housings, while filters FL1 and FL4 are mounted over the filter mounting flanges.

(3) Remove the orifice filter (4).

c. Installation.

(1) Aline the holes in the new orifice filter (4) with the threaded holes of the orifice housing (5). Position the filter cap (3) over the filter.

(2) Secure the filter cap (3) with six lockwashers (2) and screws (1).

(3) Close the cabinet lid (3, fig. 3) if filter FL1 (17, fig. 4) or FL4 (1) was replaced.

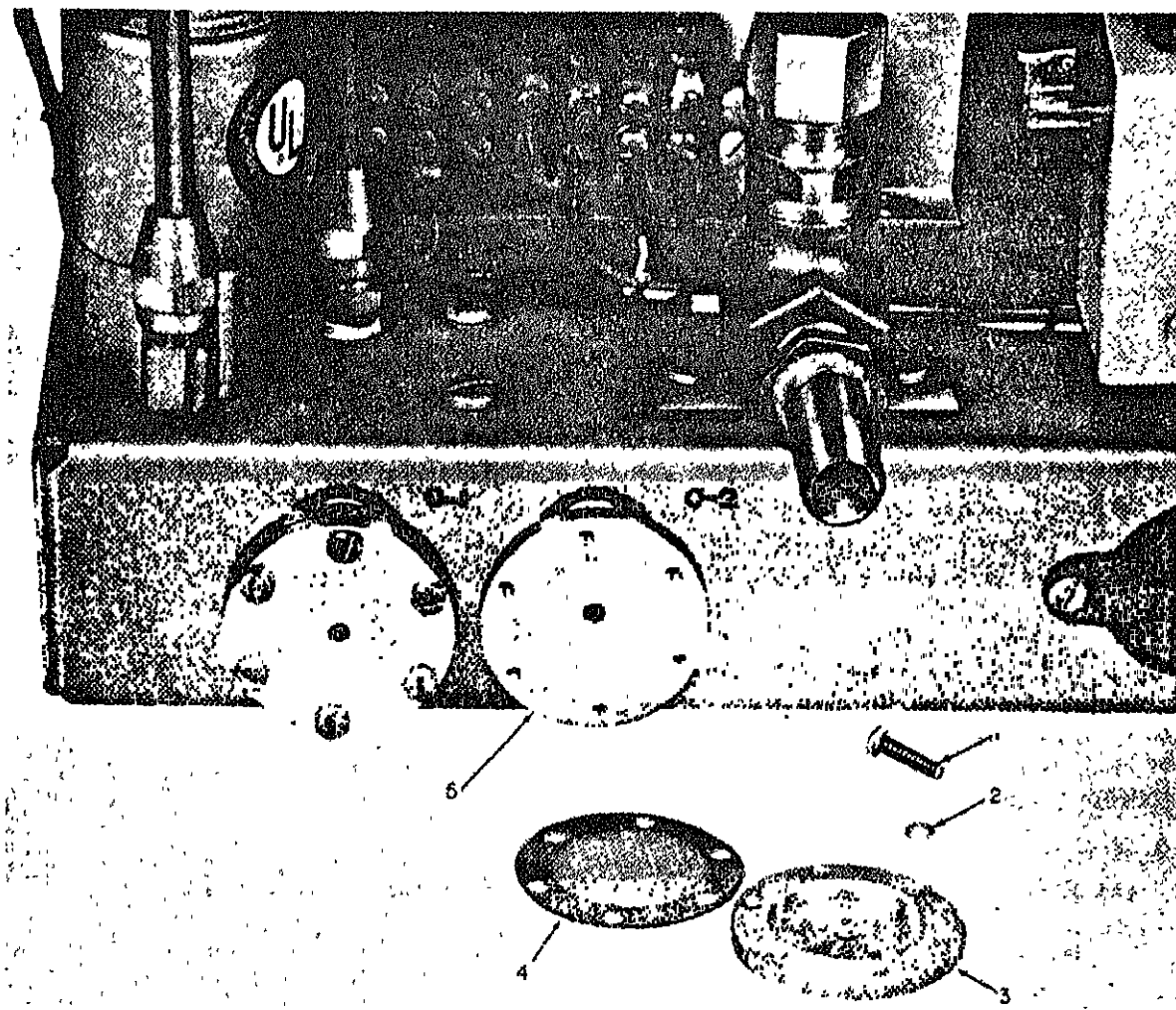
69. Fuse

a. Description. The fuse (6, fig. 6) is a standard type 3AG–5A, 250-volt fuse that is mounted inside a fuse holder (4) and a fuse cap (5). These parts are attached to the back of the chassis assembly and are easily accessible.

b. Removal.

(1) Make sure that the indicator is shut down and then disconnect the power cord from the power source.

(2) Unscrew the fuse cap (5) from the fuse holder (4) and remove the fuse cap and fuse (6) as a unit from the fuse holder.



1 Screw 2 Lockwasher 3 Filter cap 4 Orifice filter 5 Orifice housing

Figure 16. Typical removal of orifice filter.

(3) Remove the burned out fuse from the fuse cap and discard the fuse.

c. *Installation.*

(1) Install a new fuse (6) into the fuse cap (5) of the fuse holder (4).

(2) Insert the fuse into the fuse holder and screw the fuse cap tightly into the fuse holder.

70. Lamps DS1, DS2, DS3

a. Description. Three lamps, all type S6, 120-volt, 6-watt, with a threaded base, are used in the indicator. Lamp DS1 (4, fig. 4) lights the PILOT light (19, fig. 3), lamp DS2 lights the REJECT light (8), and lamp DS3 lights the ACCEPT light (9). All lamps are mounted on the back of the front panel (18).

b. Removal.

(1) Make sure that the indicator is shut down and then disconnect the power cord.

(2) To remove lamp DS1 (4, fig. 4) lift the cabinet lid (3, fig. 3) and unscrew the lamp from the socket in front of the electric chassis assembly.

(3) To remove lamp DS2, remove the panel cover assembly (15) pull the red lens from the REJECT light (8) on the front panel, and unscrew the lamp from its socket. It may be necessary to use a knifeblade or screwdriver to pry the lens off.

(4) To remove lamp DS3 remove the panel cover assembly (15) pull the green lens from the ACCEPT light (9) on the front panel, and unscrew the lamp from its socket. It may be necessary to use a knifeblade or screwdriver to pry the lens off.

c. *Installation.*

(1) Screw lamp DS3 into the ACCEPT light (9) socket and press the green lens in place. Replace the panel cover assembly (15).

(2) Screw lamp DS2 into the REJECT light (8) socket and press the red lens in place. Replace the panel cover assembly (15).

(3) Screw lamp DS1 (4, fig. 4) into the PILOT light socket and close the cabinet lid (3, fig. 3).

71. Tubing

a. Description. Rubber and plastic tubing are used in the indicator to direct air flow between various components of the chassis assembly. To provide sufficient flexibility, pieces of rubber tubing are used between filter FL1 and the VALVE fixture, between the blower and the valve of the motor and pump assembly, between the valve of the motor and pump assembly and the bleeder housing, and on the water manometer. Plastic tubing is used between the motor and pump assembly and solenoid valve L3.

b. Removal. If the tubing is cracked, broken, or deteriorated, remove the defective tubing by pulling it from the tube connector over which it fits.

c. Installation. Cut new tubing to the proper length and press the ends over the tube connectors. Make sure the fit is tight and there is no leakage.

72. Motor and Pump Assembly

a. Description and Function. The motor and pump assembly consists of a motor (11, fig. 4), a pump (12), a blower (3), and a four-way selector valve (2). The pump, driven by the motor through a reduction gear, provides air to solenoid valve L3 (17, fig. 5). The blower, driven directly by the motor, provides pressure or a vacuum to the calibrator assembly (22) depending upon the position of the selector valve. An adjustable governor controls the motor speed.

b. Adjustment. If it is found that a 1-inch pressure cannot be reached after proper orifices have been installed, and bleed air has been dcreased as far as possible, it will be necessary to increase the motor speed.

(1) With the indicator shutdown, turn the governor adjusting screw (fig. 17) clockwise.

(2) Start the indicator and observe the pressure gage.

(3) Continue steps (1) and (2) until the motor speed is just fast enough to create a greater pressure than that required to meet the particular specifications.

Note. Make sure the movable blade of the governor does not touch the stop pin after the adjustment is made.

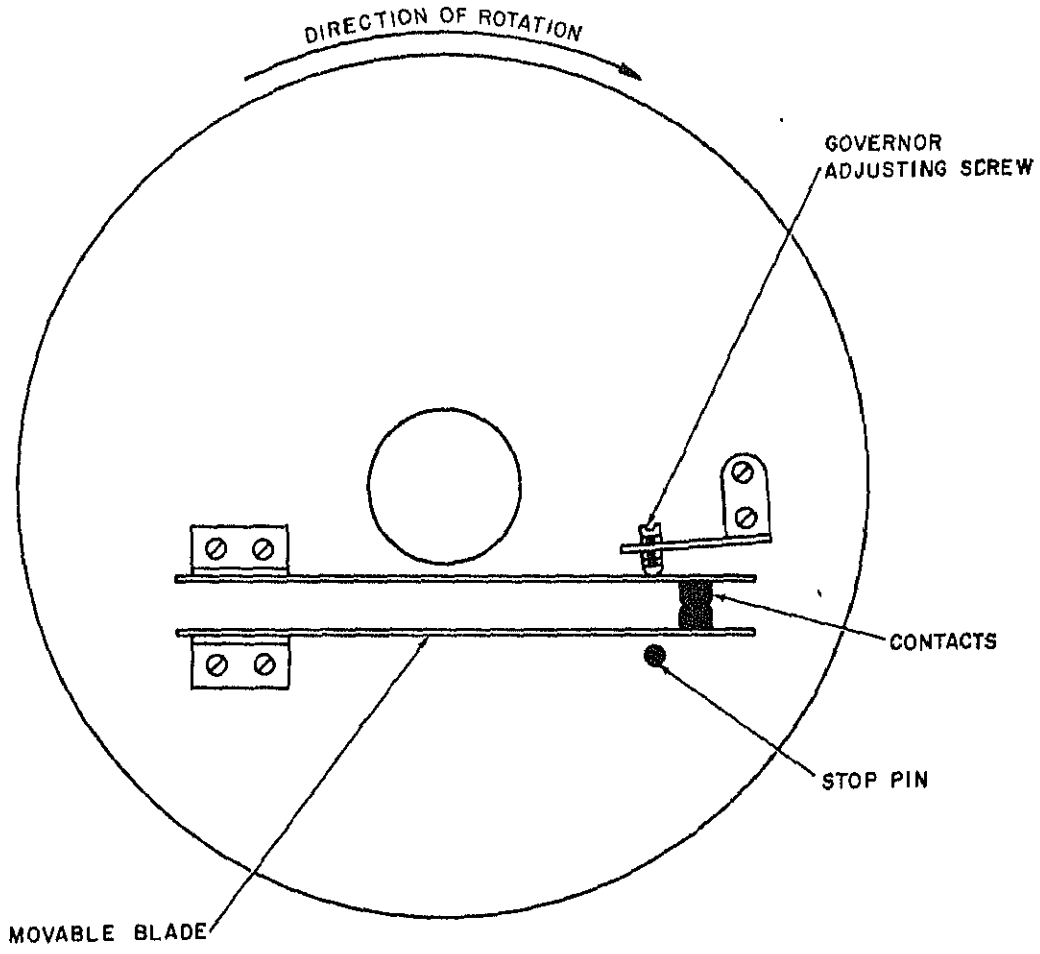


Figure 17. Motor governor adjustment.

Section VII. COVER GROUP

3. Panel Cover Assembly

a. Description. The panel cover assembly 15, fig. 3) is mounted over the front panel (18) f the indicator to protect the external controls nd instruments when the indicator is not in se. It is also used to stow some of the equipment accessories—those accessories being the water manometer and the sized pyrex orifices.

b. Maintenance. Should the panel cover become damaged in any way, replace it by pulling it from the front panel and installing a new or reconditioned cover. The water manometer and

sized pyrex orifices, if in good condition, can be stowed in the new panel cover. To assure that the sized pyrex orifices are clean, blow clean, dry compressed air through them.

74. Water Manometer

a. Description. The water manometer is a U-shaped glass tube device that is used for checking the vacuum or pressure balance on the two sides of the diaphragm in the calibrator. It is also used to check for leaks in the vacuum system.

b. Operation.

(1) Remove the water manometer (16, fig. 3) and its mounting plate from the retaining clips.

(2) Fill the 6-inch U-shaped tube with water so that the water level is approximately at the full scale mark on the manometer scale.

(3) Attach the open end of the rubber tubing to one of the two plug clocks (18, fig. 4) of the calibrator assembly (22, fig. 5). Attach the other end of the rubber tubing to the water manometer (16, fig. 3).

(4) Attach a second rubber hose to the other plug cock and to the open end of the water manometer.

(5) Open the two plug cocks and operate the indicator using an outlet valve at the VALVE fixture.

(6) During the test cycle, the vacuum pulled should read the same on the water manometer as on the pressure gage. If the readings vary, a leak is present. Notify third echelon field maintenance personnel.

Section VIII. ACCESSORIES

75. Rubber Adapters

a. Description. Various rubber adapters are furnished to adapt the indicator to the different outlet valves which can be tested. These rubber adapters are assembled into test fixture assemblies (table I) having type I or type II plungers if the testing is to be done using the VALVE fixture location of the indicator. If the testing of the outlet valve is to be done using the test probe assembly, the barrel and mask tip screw used with the rubber adapter are also shown in table I.

b. Removal.

(1) With the indicator shut down and the power cord disconnected, lift the cabinet lid.

(2) Grasp the rubber tubing (19, fig. 4) leading to the VALVE fixture (10, fig. 3) and pull the tubing from the type I or type II plunger. The test plunger is inserted through a sleeve, spring, bushing, flange, and collar in that order. To remove the plunger and rubber adapter (test fixture assembly) as an assembled unit, loosen two setscrews in the collar and one setscrew in the bushing. Pull the plunger from the VALVE fixture location being careful not to lose any of the VALVE fixture components.

(3) Remove the rubber adapter from the plunger. Typical test fixture assembly arrangements are illustrated in figure 10.

c. Installation.

(1) Install the rubber adapter on the matching type I or type II plunger (as shown in table I) and install the sleeve and spring over the plunger shaft. Insert these components into the bushing at the VALVE fixture location and tighten the setscrew in the bushing into the keyway of the plunger shaft.

(2) Install the collar over the plunger shaft and tighten the two setscrews in the collar.

(3) Install the end of the rubber tubing (19, fig. 4) leading to the VALVE fixture location onto the end of the plunger. Close the cabinet lid.

76. Sized Pyrex Orifices

a. Description. The various sized pyrex orifices required for the operation of the indicator include the comparison orifices (13 and 16, fig. 4), the balance orifices (1 and 2, fig. 5) and the calibration standards stowed in the panel cover assembly (15, fig. 3). The purpose of these orifices is described in paragraph 7*b*.

b. Service. Use clean, dry compressed air to clean the orifices. Do not attempt to clean the sized pyrex orifices with cleaning solvents or by passing objects through them.

c. Removal. Removal of the sized pyrex orifices is discussed in three parts. They are balance orifice, comparison orifice, and calibration standards removal procedure.

(1) *Balance orifices.* The balance orifices 03 and 04 are inside the balanced orifice holder. Remove the balance orifice 04 (1, fig. 5) by unscrewing the balanced orifice cap and pulling the balance orifice 04 out of the rubber tube which holds the balance orifice in place. Remove the balance orifice 03 (2) by unscrewing the balance orifice cap and pulling the balance orifice 03 out of the rubber tube which holds it in place.

(2) *Comparison orifices.* The comparison orifices 01 and 02 are inside the orifice housings that screw into the orifice block at the back of the chassis. Unscrew the orifice housing (5, fig. 16) from the orifice block as a unit. Pull the comparison orifice 02 out of the rubber tube which holds it in place. Remove the comparison orifice 01 from the orifice block by unscrewing the orifice housing and then pulling the comparison orifice 01 out of the rubber tube which holds it in place.

(3) *Calibration standards.* The calibration standard is removed from the rubber tube that connects it to the calibration testing adapter by pulling it out of the rubber tube. If the calibration standard that is to be removed is stowed in the panel cover assembly (5, fig. 3), remove the orifice by pulling it out of the clip that holds it in place.

d. Installation. Installation of the sized pyrex orifices is discussed in three parts. They are balance orifice, comparison orifice, and calibration standards installation procedure.

(1) *Balance orifices.* Consult table I to make sure of the correct sizes needed and then select two orifices marked with the correct milliliter per minute flow numbers. Find the word FLOW and the arrow on these orifices and insert the orifices into the rubber tubes inside the balanced orifice holder. Make certain that the direction of air flow matches the air flow within the indicator at the balanced orifice holder location during testing. Handtighten both balanced orifice caps in place.

(2) *Comparison orifices.* Consult table I to make sure of the correct sizes needed and then select two orifices marked with the correct milliliter per minute flow numbers. Find the word FLOW and the arrow on these orfiices and insert them into the rubber tubes inside the orifice block. Make certain that the direction of air flow matches the air flow within the indicator at this location during testing. Handtighten both orifice housings in place.

(3) *Calibration standards.* Consult table I to make sure of the correct sizes needed and then select two orifices with the correct milliliter per minute flow numbers marked on them. Find the word FLOW and the arrow on these orifices and insert the orifices into the rubber tubes. Make certain that the direction of air flow matches the air flow within the indicator at the VALVE fixture location during testing. Insert the other ends of the rubber tubes over the metal testing adapters. These assembled calibration testing adapters are then press fitted over the VALVE fixture during calibration testing of the indicator.

CHAPTER 5

SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

77. Shipment

The indicator is shipped in the same type of container in which it was initially received. Stow the power cord, logbook, and technical manuals in the indicator and insert the indicator in a cardboard carton. With the carton installed in a wooded crate, install filler material between the sides of the indicator and the inside of the carton. Nail the crate top to the crate sides and identify the container top with stencilled markings such as "CAUTION: THIS SIDE UP" and "LOGBOOK AND TECHNICAL MANUALS INSIDE".

78. Limited Storage

a. Inspection. Make certain that the indicator is in good operating condition and does not require overhaul or replacement of parts. Refer to the preventive maintenance checklist (par. 57). Refer to AR743-41 for information on storage of equipment and supplies.

b. Cleaning and Painting. Thoroughly clean l parts and touch up the paint as required ɔar. 54).

c. Protection in Storage. Cover the TEST ROBE electrical receptacle connector, the line ɛceptacle connector, the test counter receptacle ɔnnector, the air shutoff valve, and the ALVE fixture air opening with pressure-nsitive adhesive tape.

9. Demolition to Prevent Enemy Use

a. General. When capture by or abandonnent of the indicator to an enemy is imminent, the responsible commander must make the decision either to destroy the unit or make it inoperative. Whichever method of demolition is employed, it is essential to destroy the same vital parts of all units and all corresponding repair parts.

b. Methods of Destruction. Listed below are several methods which can be utilized to destroy the indicator. Since time s usually critical in a situation like this, the method of destruction requires imaginaton and resourcefulness in utilizing what is at hand to prevent the enemy from restoring the equipment to a usable condition either by repair or cannibalization.

(1) *Explosives.* Place a charge within the cabinet on top of the chassis assembly. For a description of explosives and their accessories, their use, and the precautions necessary for safe handling, refer to FM 5-25.

(2) *Mechanical means.* Use an axe, sledge hammer, crowbar, pick, or any other heavy implement which may be available to destroy the indicator. Open the cabinet lid and made certain the chassis and its components are smashed.

(3) *Weapons fire.* Fire on the indicator with small arms.

(4) *Burning.* Pack rags, clothing, or other flammable material in and around the indicator. Saturate this packing with oil or other fuel and ignite.

APPENDIX I

REFERENCES

AR 320–5	Dictionary of United States Army Terms.
AR 320–50	Authorized Abbreviations and Brevity Codes.
AR 740–12	Covered and Open Storage of Supplies.
FM 5–25	Explosives and Demolitions.
TM 3–6665–209–20P	Organizational Maintenance Repair Parts and Special Tool Lists for Indicator, Outlet Valve Leakage, M4A1.
TM 9–213	Painting Instructions for Field Use.
TM 38–750	The Army Equipment Record System and Procedures.

APPENDIX II

MAINTENANCE ALLOCATION CHART

1. Explanation of Columns

a. Column 1, Index Number. Column 1 lists the number which is assigned to each group, component, assembly, or subassembly to facilitate references. The numbers are identical to and in the same sequence as those assigned to the same group, component, assembly, or subassembly in the repair parts and special tool lists.

b. Column 2, Component and Related Maintenance Operations. Column 2 lists groups, components, assemblies, subasemblies, and parts on which maintenance can be performed; and the maintenance operations which are authorized to be performed on each.

c. Columns 3, 4, 5, 6, and 7, Maintenance Echelon. Columns 3, 4, 5, 6, and 7 indicate by an X the lowest echelon authorized to perform the prescribed maintenance operation.

d. Column 8, Remarks. Column 8 is used for special instructions.

2. Use of Chart

The maintenance allocation chart will be used in conjunction with TM 3–6665–209–12 and TM 3–6665–209–35. Determine from the chart the echelon that is authorized to perform the required maintenance operation. Refer to the text in the appropriate part of the manual for instructions in performing the authorized maintenance operations defined below.

SERVICE	To clean, to preserve, and to replenish fuel and lubricants.
ADJUST	To regulate periodically to prevent malfunction.
INSPECT	To verify serviceability and to detect incipient electrical or mechanical failure by scrutiny.
TEST	To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, and the like.
REPLACE	To substitute serviceable assemblies and subassemblies for unserviceable component parts.
REPAIR	To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes but is not limited to, inspecting, cleaning, preserving, adjusting, replacing, welding, riveting and straightening.
ALINE	To adjust two or more components of an electrical system so that their functions are properly synchronized.
CALIBRATE	To determine, check, or rectify the graduation of an instrument, weapon, or weapons system, or components of a weapons system.
OVERHAUL	To restore an item to completely serviceable condition as prescribed by serviceability standards developed and published by heads of technical services. This is accomplished through employment of the technique of "Inspect and Repair Only

as Necessary" (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the item during the overhaul process.

SYMBOL X — The symbol X placed in the appropriate column indicates the echelon responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Echelons higher than the echelon marked by X are authorized to perform the indicated operation.

SYMBOL "%%" — The symbol "%%" indicates that second echelon personnel may perform the particular maintenance operation provided the request originates from organizational level and is specifically authorized by the direct support technical service officer. In no case will performance of a "double percent" operation be directed by the direct support technical service officer, and in no case will a "double percent" operation authorize stockage of parts at organizational level.

Maintenance Allocation Chart

Index No. (1)	Component and related maintenance operation (2)	Maintenance echelon 1st (3)	2d (4)	3d (5)	4th (6)	5th (7)	Remarks (8)
	100—CHASSIS GROUP						
	101—ELECTRICAL COMPONENTS SECTION						
2	Chassis Assembly						
	Repair				X		
	Replace		X				
3, 4	Capacitors						
	Replace				X		
5	Electron Tube						
	Replace		X				
12, 13, 14	Resistors						
	Replace				X		
28, 29	Timers						
	Replace				X		
30	Transformer						
	Replace				X		
	102—MECHANICAL COMPONENTS SECTION						
33	Chassis Assembly						
	Repair				X		
	Replace		X				
46	Capacitor						
	Replace				X		
54	Filter, Orifice						
	Replace		X				
59	Gage Pressure						
	Replace				X		

Maintenance Allocation Chart—Continued

Index No. (1)	Component and related maintenance operation (2)	Maintenance echelon 1st (3)	2d (4)	3d (5)	4th (6)	5th (7)	Remarks (8)
103	Switches						
104, 105, 106	Replace	------	------	------	X		
110	Transformer						
	Replace	------	------	------	X		
115, 116	Valves, Solenoid						
	Replace	------	------	------	X		
	103—CALIBRATOR SECTION						
121	Calibrator Assembly						
	Adjust	X					
	Repair	------	------	------	X		
	Replace	------	------	------	X		
	104—MOTOR AND PUMP ASSEMBLY SECTION						
163	Motor and Pump Assembly						
	Inspect	X					
	Service	X	------	------	------	------	Lubricate
	Adjust	------	X	------	------	------	Governor setting
	Repair	------	------	------	X		
	Replace	------	------	X			
198	Valve and Blower Adapter						
	Replace	------	------	X			
	105—VALVE ASSEMBLY SECTION						
204	Valve Assembly						
	Replace	------	------	X			
	200—CABINET GROUP						
209	Cabinet Assembly						
	Repair	------	------	X			
	Replace	------	------	------	------	X	
	800—COVER GROUP						
225	Panel Cover Assembly						
	Replace	------	X				
82	Water Manometer						
	Replace	------	------	X			
35, 36	Orifice						
	Service	X	------	------	------	------	
	Replace	------	X	------	------	------	Clean
	400—PROBE GROUP						
246	Probe Assembly						
	Repair	------	------	X			
	Replace	------	X				
	500—ACCESSORY GROUP						
270, 271	Testing Adapters						
	Replace	------	------	X			

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Maintenance Allocation Chart—Continued

Index No. (1)	Component and related maintenance operation (2)	Maintenance echelon					Remarks (8)
		1st (3)	2d (4)	3d (5)	4th (6)	5th (7)	
272 to 288	Orifices						
	Service	------	X				
	Replace	------	------	------	X	------	Clean
284	Test Valve Plunger Assembly						
	Repair	------	X				
	Replace	------	X				

APPENDIX III

BASIC ISSUE ITEM LIST

Section I. INTRODUCTION

1. Purpose and Scope

This appendix furnishes the user of the M4A1 outlet valve leakage indicator with a list of the major components and the supplies, tools and repair parts that comprise the end item.

2. Explanation of Columns

a. Federal Stock Number. Federal stock numbers are assigned by the Federal Cataloging Program and are to be used in accordance with AR 709–15.

b. Description. The approved federal item name appears in upper case letters. Modifiers necessary for proper identification appear in lower case letters.

c. Unit of Issue. The unit of issue for each item is indicated in this column.

d. Expendability. The symbol NX indicates that an item is nonexpendable. When no symbol appears, the item is expendable.

e. Quantity Authorized. Quantities listed represent the repair parts, spare assemblies, supplies, and special tools authorized for first echelon maintenance. The authorized quantities for each end item must be on hand or in order at all times.

f. Illustrations. This column contains the figure number of each illustration and the item number on that illustration for indicated components.

3. Abbreviations

The abbreviations used herein are as follows

fig. ---------- figure
No. ---------- number
NX ---------- nonexpendable

Section II. BASIC ISSUE ITEM LIST

Federal stock No.	Description	Unit of issue	Expendability	Quantity authorized	Illustrations	
					Figure No.	Item No.
6665–738–2128	INDICATOR, OUTLET VALVE LEAKAGE, M4A1	ea	NX		1	
	MAJOR COMPONENTS					
6665–777–6599	CABINET ASSEMBLY	ea			3	5
6665–779–5931	CALIBRATOR ASSEMBLY	ea			5	22
6665–778–6003	CHASSIS ASSEMBLY	ea			5	
6665–779–5928	CHASSIS ASSEMBLY, ELECTRIC	ea			5	8
6665–775–8936	COVER, PANEL ASSEMBLY	ea			3	15
6665–779–5926	MOTOR AND PUMP ASSEMBLY	ea			5	11
6665–792–2534	PROBE ASSEMBLY	ea			8	
	ACCESSORIES GROUP					
6665–784–1602	ADAPTER, TESTING	ea				
6665–736–3229	ADAPTER, TESTING	ea				
6665–808–8830	ORIFICE, pyrex, size 1	ea				
6665–808–8831	ORIFICE, pyrex, size 2	ea				
6665–808–8832	ORIFICE, pyrex, size 3	ea				

Section II. BASIC ISSUE ITEM LIST—Continued

Federal stock No.	Description	Unit of issue	Expendability	Quantity authorized	Illustrations	
					Figure No	Item No
6665-808-8836	ORIFICE, pyrex, size 7	ea				
6665-809-0466	ORIFICE, pyrex, size 14	ea				
6665-809-0467	ORIFICE, pyrex, size 15	ea				
6665-809-0468	ORIFICE, pyrex, size 16	ea				
6665-474-7261	ORIFICE, pyrex, size 17	ea				
6665-076-6992	ORIFICE, pyrex, size 18	ea				
6665-076-6991	ORIFICE, pyrex, size 19	ea				
6665-076-6990	ORIFICE, pyrex, size 20	ea				
6665-076-6989	ORIFICE, pyrex, size 21	ea				
6665-798-3438	PLUNGER, TEST VALVE ASSEMBLY	ea	----	----	10	
6665-070-5551	ADAPTER	ea				
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6665-070-5556	ADAPTER, TESTING	ea				
6665-070-5550	ADAPTER ASSEMBLY	ea				
6665-070-5549	BARREL ASSEMBLY	ea				
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By Order of the Secretary of the Army:

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Major General, United States Army,
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USAR: None.

For explanation of abbreviations used, see AR 320-50.

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